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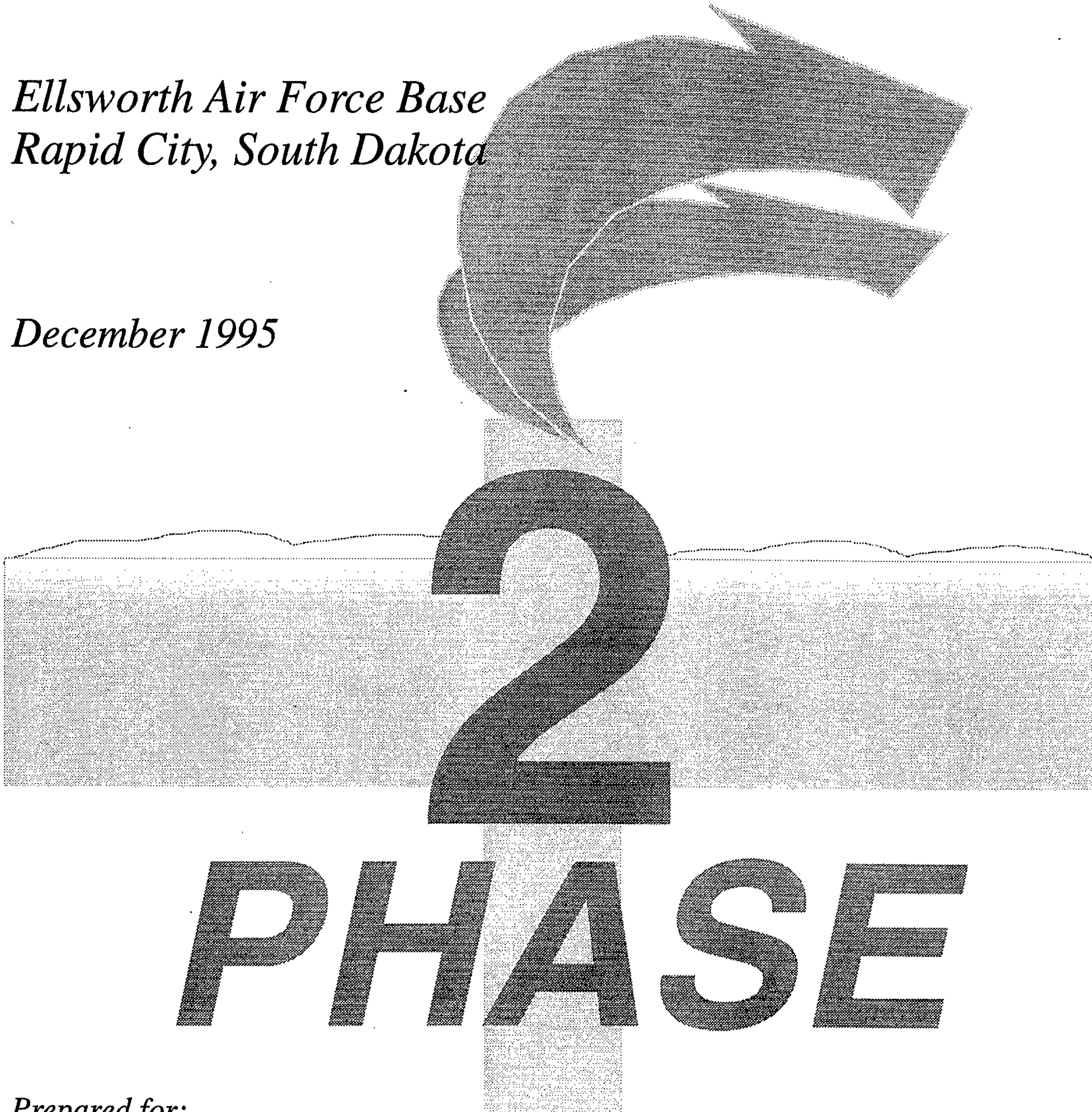
Final

2-Phase™ Pilot Test Technology Evaluation Report

Ellsworth Air Force Base
Rapid City, South Dakota

December 1995



Prepared for:

U.S. Army Corps of Engineers
Omaha District

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13 December 1995

U.S. Army Corps of Engineers, Omaha District
ATTN: CEMRO-ED-EB (Robert Zaruba)
215 North 17th Street
Omaha, Nebraska 68102-4978

SUBJECT: Contract No. DACA45-93-D-0027, Delivery Order No. 27, Mod No.2; Final Ellsworth AFB 2-Phase Pilot Test technology Evaluation Report

Dear Mr. Zaruba:

Enclosed you will find two copies of the final Ellsworth AFB 2-Phase Pilot Test Technology Evaluation Report for the work accomplished at Operable Unit No. 1 and associated response to comments. The only comments received were from the Omaha District Corps of Engineers (COE) staff. Ellsworth AFB staff (Mr. Dell Petersen and Mr. John DeYoe) were contacted and indicated that they would not be providing written comments.

Additional copies of the report have been distributed to Ellsworth AFB, and to Ms. Margaret Calvert at Langley AFB.

If you have any questions regarding this report, please contact me at (916) 857-7281 or Mr. James Machin at (512) 419-5280.

Sincerely,

FRANCIS E. SLAVICH, P.E.
Project Manager

c: Margaret Calvert, ACC/ESVW (2)
Dell Petersen, Ellsworth AFB (7)
James Machin, Radian
Bill BuChans, Radian
John Yackiw, Radian
Gary Dyke, Radian

ELLSWORTH AFB
2-PHASE™ PILOT TEST
TECHNOLOGY EVALUATION REPORT

Ellsworth Air Force Base
South Dakota

Prepared for:

U.S. Army Corps of Engineers
Omaha District
ATTN: CEMRO-ED-EB
215 North 17th Street
Omaha, Nebraska 68102

Prepared by:

Radian Corporation
1093 Commerce Park Drive, Suite 100
Oak Ridge, Tennessee 37830

Doc. #F950824.1DP51

REGISTERED PROFESSIONAL ENGINEER
FRANCIS E. SLAVICH
No. 50473
Exp. 6-30-97
CIVIL
STATE OF CALIFORNIA

December 1995

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ACRONYMS

ACC	Air Combat Command
AFB	Air Force Base
BGS	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
DCA	Dichloroethane
DCE	Dichloroethylene
DNAPL	Dense Nonaqueous Phase Liquid
EPA	U.S. Environmental Protection Agency
ESVE	Enhanced Soil Vapor Extraction
FPTA	Fire Protection Training Area
GAC	Granular Activated Carbon
HQ	Headquarters
IRA	Interim Remedial Action
LNAPL	Light Nonaqueous Phase Liquid
MCL	Maximum Contaminant Level
O&M	Operation and Maintenance
OU-1	Operable Unit 1
PCE	Tetrachloroethylene
PREECA	Presumptive Remedy Engineering Evaluation/Cost Analysis
PVC	Polyvinyl Chloride
RI	Remedial Investigation
SVE	Soil Vapor Extraction
TCE	Trichloroethylene
TPE	Xerox 2-Phase™ Extraction
USAF	U.S. Air Force
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

1.0 INTRODUCTION

In June 1995, Ellsworth Air Force Base (AFB), in Rapid City, South Dakota, and Radian Corporation (Radian) completed a five-day pilot treatability test at the fire protection training area burn pit of Operable Unit 1 (OU-1) using the Xerox 2-Phase™ Extraction (TPE) technology. This report provides a summary of the methodology used during the test, the test results, and base-specific recommendations.

1.1 Purpose/Objectives

On 5 May 1995, Headquarters (HQ) Air Combat Command (ACC) published *United States Air Force Presumptive Remedy Engineering Evaluation/Cost Analysis* (PREECA) [U.S. Air Force (USAF) 1995] as a standardized decision framework specifying the criteria and associated decision logic necessary for implementing a nontime-critical removal action. This decision framework, developed by Radian in conjunction with the U.S. Army Corps of Engineers and the USAF, combines the standard Comprehensive Environmental Response, Compensation, and Liability Act nontime-critical removal action process with the concept of presumptive remedies and a "plug-in" logic tree approach. The result is a "generic" remedy selection document for all USAF installations that facilitates early and substantial risk reduction at USAF sites. **PREECA applies only to a closely defined subset of conditions** that the USAF has found to be common and that pose sufficient risk to justify nontime-critical removal actions. **This methodology was not intended to be used at sites where the need for cleanup actions is not readily apparent.**

PREECA focuses on remedies that can satisfy the majority of common USAF contamination situations, namely in situ bioventing, soil vapor extraction (SVE), groundwater pump and treat for containment, and capping. **However, REECA is intended to be updated as new, successful remedies are established.** The USAF is currently gathering extensive cost and performance data at a number of contaminated sites for intrinsic groundwater remediation, bioslurping, and 2-Phase™ extraction. As part of this effort, HQ ACC has contracted with Radian through the Omaha District Corps of Engineers to evaluate the TPE technology for inclusion in the USAF PREECA. Radian, in conjunction with the USAF, developed an initial remedy profile for TPE as part of the original PREECA efforts.

This report presents the results of the TPE pilot test conducted at Ellsworth AFB in June 1995. It compares the pilot test results to PREECA's initial remedy profile for TPE and demonstrates that TPE is an effective technology for use at Ellsworth AFB. In addition, it presents data on additional objectives for the pilot test, which were to:

- Demonstrate the contaminant removal effectiveness of the TPE technology;
- Determine the feasibility of installing a full-scale system;
- Collect sufficient engineering data to facilitate the design, installation, and operation of a full-scale extraction and treatment system; and
- Assist in the prevention of contaminant migration, thereby minimizing the threat of exposure to human health and the environment.

TPE was selected for testing at the OU-1 burn pit because the low saturated zone permeabilities limit the effectiveness of conventional pump and treat systems to capture groundwater contaminant plumes. Ellsworth AFB is in the process of implementing an interim remedial action at OU-1 that will consist of SVE and groundwater pump and treat (dual-phase). A large complement of information exists for OU-1, including the remedial investigation (RI) report (EA Engineering 1994a) and the data from two previous treatability studies. The TPE technology is designed to enhance control of groundwater plumes in low- to moderate-

permeability formations, as well as to remove contaminants from the saturated and vadose zones.

1.2 Site Background

OU-1 is located in the southwestern portion of Ellsworth AFB as shown in Figure 1-1. This site was used as a fire protection training area (FPTA), resulting in significant soil and groundwater contamination. Previous field activities in the area have included installation and sampling of wells, two soil vapor surveys, an SVE pilot test, water level measurements, aquifer testing, and groundwater recovery and treatment. Data collected from these activities, in addition to data from this project, have been used to characterize the subsurface features and the nature and relative extent of contamination at the site.

1.2.1 Subsurface Features

The OU-1 area is underlain by approximately 15 to 18 ft of fill and native soil (alluvium) that overlies shale bedrock (Pierre Shale). The native soil consists primarily of fine grained sands, silts, and clays of low permeability, but much of the FPTA has been filled with coarser grained sand and gravel of higher permeability. The upper 10 to 15 ft of the shale is weathered and consists of variably fractured light olive gray to dark olive gray clay, which increases in competence with depth. The permeability of the weathered and fractured shale is low. Figure 1-2 is a geologic cross-section demonstrating the distribution of soil types in the test area.

Based on the lithologic information from inspection of soil samples, the relative permeability of the soils can be inferred. The upper 3 to 5 ft of sandy clay and clayey gravel have lower permeabilities. Silt, sand, and gravel deposits between approximately 3 and 18 ft represent higher permeability materials. Data from an SVE test at the site conducted by EA Engineering, Science, and Technology indicate a relative permeability to air of 200 to 300 Darcy in the vadose zone alluvium. Finally, weathered and fractured shale beginning at approximately 15 to 18 ft are representative of low permeability materials.

The primary TPE well (existing monitoring well MW 930101) within the burn pit was completed in both the alluvium and shale bedrock and was screened from 12 to 42 ft below ground surface (BGS). Depth to groundwater is 16.5 ft BGS (based on water level measurements from June 1995). The saturated alluvial thickness ranges from 0.5 to 1.5 ft, with the remainder of the saturated zone occurring in the weathered and fractured shale. Hydraulic conductivity in the saturated zone is very low (9.5×10^{-6} cm/sec) based on previous slug tests at MW 930101. The sustained pumping yield for this well has not been measured but is low, based on recharge times following well purging during previous sampling.

An existing enhanced soil vapor extraction (ESVE) well was used for a secondary TPE test following the primary test at MW 930101. This ESVE well was installed in the saturated fractured shale zone to a depth of 35 ft BGS with a 10 ft screened section (24 to 34 ft). Depth to groundwater was 17.1 ft BGS.

Additional piezometers and vapor points were installed during a previous treatability study in 1994. Data on depths and screen intervals is presented in Section 2.0 of this report.

Groundwater flow direction is generally to the south and southwest.

1.2.2 Nature and Extent of Contamination

Both vadose zone and capillary fringe soil contain high concentrations of JP-4; benzene, toluene, ethylbenzene, and xylenes (BTEX); and chlorinated volatile organic compounds (VOCs). The following general concentration ranges of these contaminants were found in FPTA area soils:

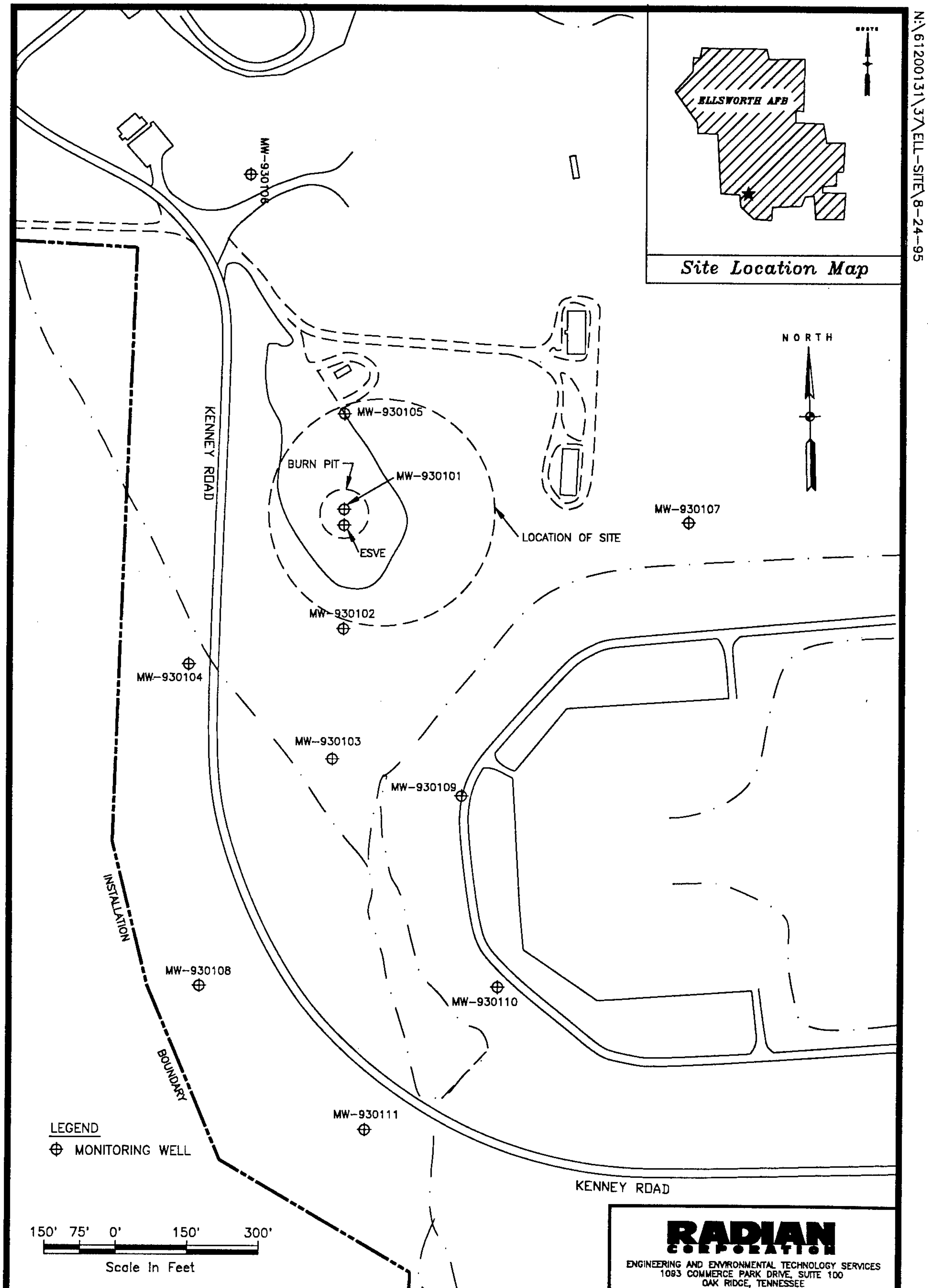

Figure 1-1. OU-1 Site, Ellsworth AFB

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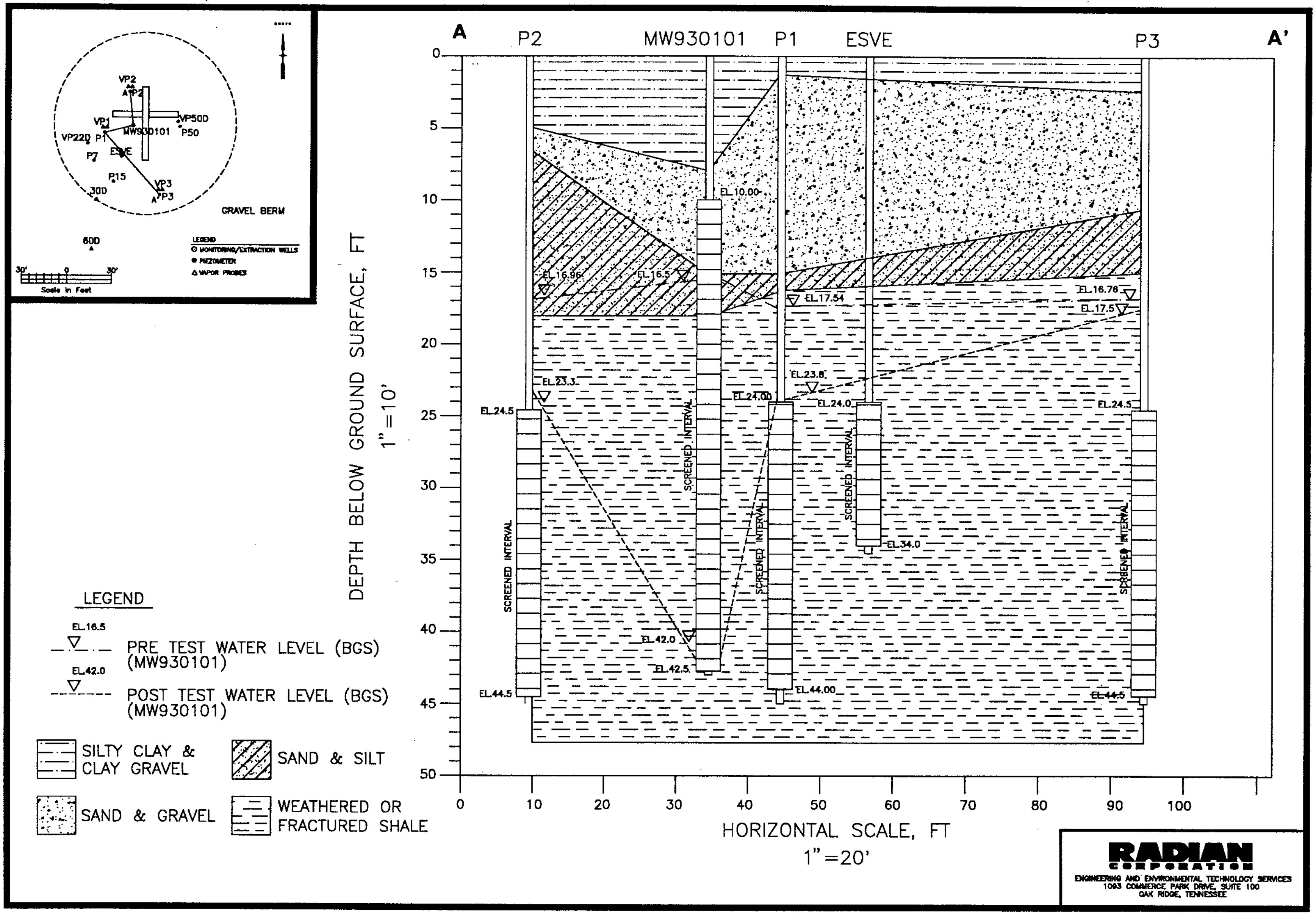

Figure 1-2. OU-1 Conceptual Cross Section

Contaminant	Vadose Zone (µg/kg)	Capillary Fringe (µg/kg)
JP-4	100,000s to 1,000,000s	100,000s to 1,000,000s
Total BTEX	ND to 100,000s	1,000s to 10,000s
Total chlorinated VOCs	ND to 10s	ND to 100s

ND = Nondetect

The RI indicated that light nonaqueous phase liquids (LNAPLs) (JP-4 and the related BTEX compounds) were found in soil at the south end of OU-1; JP-4 is present in much higher concentrations than other contaminants. In general, the distribution of JP-4 reflects the extent of organic contaminants in soil.

Trichloroethylene (TCE), benzene, tetrachloroethylene (PCE), 1,1-dichloroethylene (1,1-DCE), and 1,2-dichloroethane (1,2-DCA), were reported at or above their established Safe Drinking Water Act Maximum Contaminant Level (MCL) in one or more groundwater samples at OU-1. Dense nonaqueous phase liquids (DNAPLs) were not found in the OU-1 groundwater; however, LNAPLs were found at the northern and southern ends of OU-1.

2.0 2-PHASE™ EXTRACTION TEST METHODOLOGY

The following information on the technical approach and the sampling and analytical methodologies is a summary of the *Ellsworth AFB 2-Phase™ Extraction Pilot Test Work Plan* (Radian Corporation 1995). Additional details are contained in that document.

2.1 Test Procedures

A four-day pilot test was conducted on MW 930101. Three new piezometers, P-1, P-2, and P-3, and three vapor point clusters, each consisting of a shallow and a deep point, were constructed for the test. Existing monitoring wells in the area surrounding MW 930101 were also used to measure changes in subsurface conditions. Additionally, following the four-day test, a one-day pilot test was conducted on a well previously installed for an ESVE study. The same piezometers, vapor points, and monitoring wells were used for that test. The locations of the test wells and monitoring points are shown in Figure 2-1. Well, piezometer, and vapor point characteristics are summarized in Table 2-1. Well logs are included in Appendix B.

2.1.1 Installation of Piezometers and Vapor Probes

2.1.1.1 Piezometers

The piezometers (P-1, P-2, and P-3) were installed in order to monitor the response of the aquifer to the test. Piezometers were located at distances of 11.5, 25.2, and 51.8 ft from extraction well MW 930101. The locations were chosen such that data from the wells would supplement data collected from existing wells previously installed in the area. Figure 2-1 shows the locations of the new and existing wells.

The piezometers were installed on 20 and 21 June 1995 using a hollow stem auger drilling rig with 7.5-in. outside diameter augers. Soil samples were collected from selected intervals so that lithologic logs could be prepared (Appendix B). The piezometers were constructed with 2-in. diameter polyvinyl chloride (PVC) well casing and screen. The well casing, sand pack, and bentonite seal were installed through the augers to ensure the stability of the well bore. The details of the wells are contained in the completion logs in Appendix B. In general, 20-ft long screens were placed within the weathered Pierre Shale at a depth of 25 to 45 ft below the ground surface.

After the wells were completed, they were developed to remove silt and clay and ensure communication with the aquifer. The wells were first surged with a 2-in., vented, surged block to loosen up the fine material from the sand pack so that it could be removed. The piezometers were then purged using a disposable bailer. Water quality was monitored during development by visually observing the silt and clay content of the water and by pH meter measurements. Development was judged complete when the pH was stable and turbidity of the water had decreased to the satisfaction of the supervising geologist. All wells were bailed essentially dry within an hour and allowed to recharge. Development logs are contained in Appendix B.

2.1.1.2 Vapor Probes

Three sets of two nested vapor probes (a total of six probes) were installed at locations chosen to supplement the existing probes at the site. The new probes were labeled VP-1S, VP-1D, VP-2S, VP-2D, VP-3S, and VP-3D and are shown on Figure 2-1.

The vapor probes were installed on 21 and 22 June 1995 using a hollow stem auger drilling rig and 10-in. outside diameter augers. Soil samples were not collected from the borings for the probes as they were all located within approximately 5 ft of one of the new piezometers. The probes were constructed using 1-in. diameter PVC casing. Slots were cut in the bottom 2 ft of the probes with a hacksaw to allow communication with the vadose zone. Two probes were installed per boring at depths

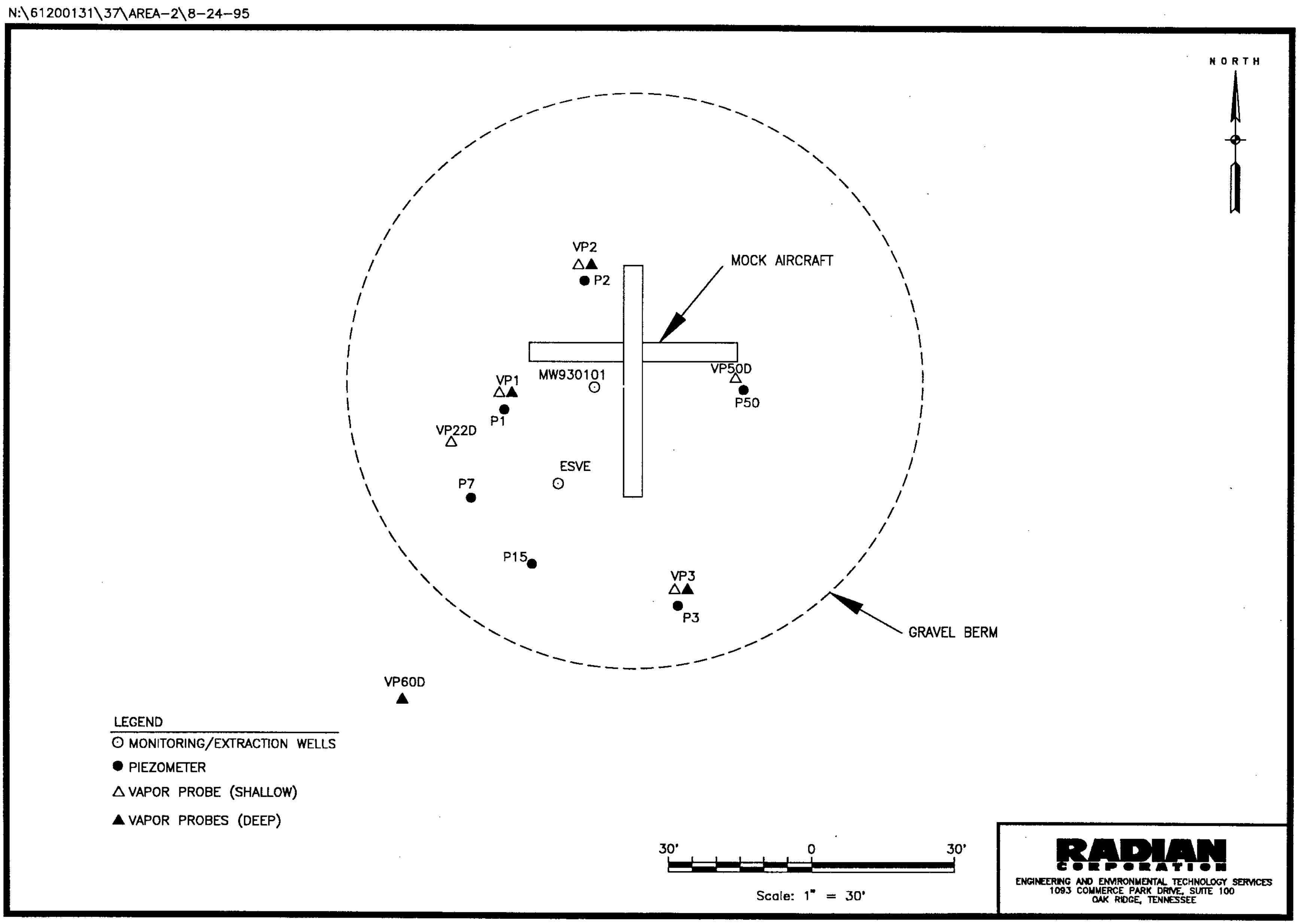

Figure 2-1. OU-1, Test Well and Monitoring Wells, Ellsworth AFB

Table 2-1

Summary of Wells and Monitoring Point Characteristics

Well/Piezometer ID	Used to Monitor	Total Depth (ft BGS)	Screened Interval (ft BGS)	Approximate Distance from MW 930101 (Test Well)
VP-1D	Induced Vacuum	15	13–15	15.3
VP-1S	Induced Vacuum	5.5	3–5	15.3
VP-2D	Induced Vacuum	15	13–15	30.5
VP-2S	Induced Vacuum	5.5	2.5–5	30.5
VP-3D	Induced Vacuum	16	13–15	45.4
VP-3S	Induced Vacuum	5.5	3–5	45.4
P-1	Water Level	44.5	24–44	11.5
P-2	Water Level	45	24.5–44.5	25.2
P-3	Water Level	45	24.5–44.5	51.8
P-7	Water Level	35	15–22	22.8
P-15	Water Level	35	15–22	37.4
P-50	Water Level	23	15–22	39.7
VP-22D	Induced Vacuum	14	11.5–13.5	21.9
VP-50D	Induced Vacuum	14	11.5–13.5	39.7
VP-60D	Induced Vacuum	14	11.5–13.5	81.4
MW 930101	Extraction Well	43	12–42	0
ESVE Well	Extraction Well	35	24–34	22.5

BGS = Below Ground Surface

of 15 ft and 5 ft. The slotted intervals were separated by a bentonite seal to eliminate communication through the sand pack.

2.1.2 Test Equipment

The test was conducted using a trailer-mounted, 25-horsepower, high-vacuum extraction unit capable of producing an air flow rate of 300 cubic feet per minute (acfm) at 25 in. mercury. The system is shown in schematic in Figure 2-2. Extracted groundwater was treated using liquid-phase granular activated carbon (GAC) before discharge to a 5000-gal temporary storage tank; extracted vapor was discharged to the atmosphere.

After the wastewater analytical results were received and reviewed by the base environmental staff, the wastewater was transported and discharged to the sanitary sewer. A general schematic of a TPE well is shown in Figure 2-3. Procedures followed during the testing are summarized in the work plan described in Section 2.0.

In the work plan, Radian proposed performing this pilot test using an existing monitoring well (MW 930101). Initial results from MW 930101 suggested that the majority of contaminant removal was from the vadose zone. This is because the well screen in MW 930101 was open across both the upper gravelly vadose zone and the lower fractured shale saturated zone. When steady state flow conditions were reached three days after the start of the test, Radian requested permission to deviate from the work plan from the Omaha District, U.S. Army Corps of Engineers, and Ellsworth AFB environmental staff. Permission was received to move the test from MW 930101 to ESVE after the fourth day of the TPE test.

The screened interval in ESVE is in the fractured shale in the saturated zone and is isolated from the upper sandy vadose zone. Therefore, data from this portion of the test were useful in assessing the performance of TPE strictly in the fractured shale.

2.2 Sampling and Analytical Methodologies

All sampling and analytical procedures (except where noted) were conducted in accordance with procedures and protocols described in the U.S. Environmental Protection Agency (EPA)-approved Ellsworth AFB Quality Assurance Project Plan. Sampling locations and frequency are summarized in Table 2-2.

2.2.1 Sampling Methodology

System parameters and ambient air conditions were measured through various vacuum gauges, meters, and thermometers included on the TPE trailer. Groundwater drawdown in the observation wells was measured using an electronic water level meter, and induced vacuum was measured using Magnehelic® gauges. Data collected were recorded on field data tables (Appendix C).

Baseline groundwater samples from MW 930101 were collected prior to TPE testing in 40-mL volatile organic analysis (VOA) vials using a dedicated Teflon® bailer. Prior to collecting the baseline samples, three well volumes of water were purged from the well. Approximately one hour after ending the test, post-test groundwater samples were collected using the dedicated bailer.

Water samples collected during the test were taken directly from the TPE trailer knock-out pot with VOA vials. All VOA vials were iced and stored in a dedicated cooler until shipped to Energy Laboratories, Inc., in Rapid City, South Dakota.

Vapor samples were collected using disposable syringes and evacuated vials provided by Microseeps Inc., Pittsburgh, Pennsylvania. Once the samples were collected, they were stored at ambient conditions until shipped to the Microseeps laboratory for analysis.

Quality control samples were also collected in the field. Duplicate water and vapor samples were collected at a 10% frequency by the methods

previously described. Trip blanks accompanied the VOA vials throughout shipping and handling.

2.2.2 Analytical Methodology

Groundwater samples were analyzed for VOCs by EPA Method SW-8260. Soil vapor samples were analyzed for VOCs by Microseeps Analytical Method AM 4.02.

N:\61200131\27\FIG_3-1

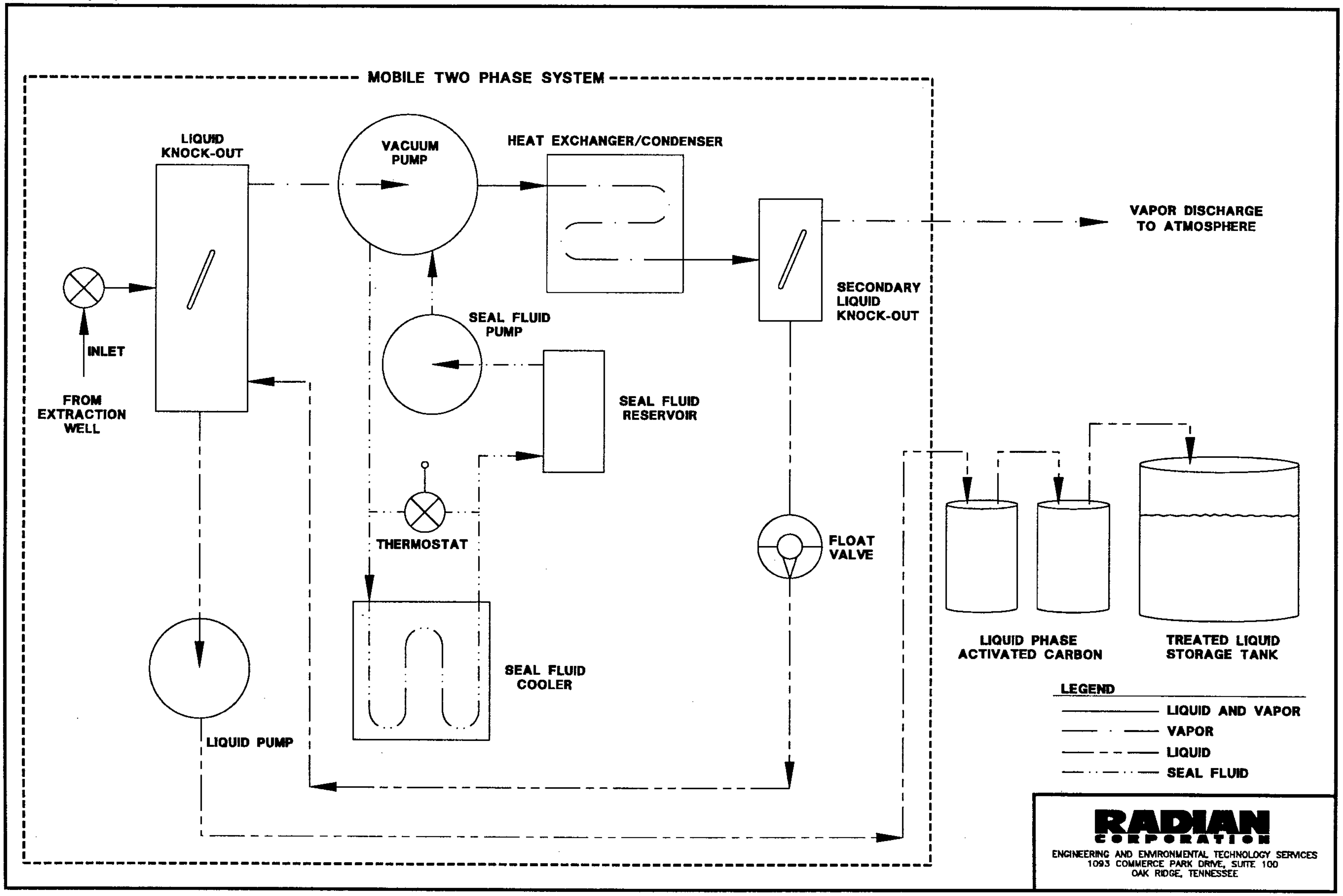

Figure 2-2. 2-Phase™ System Schematic

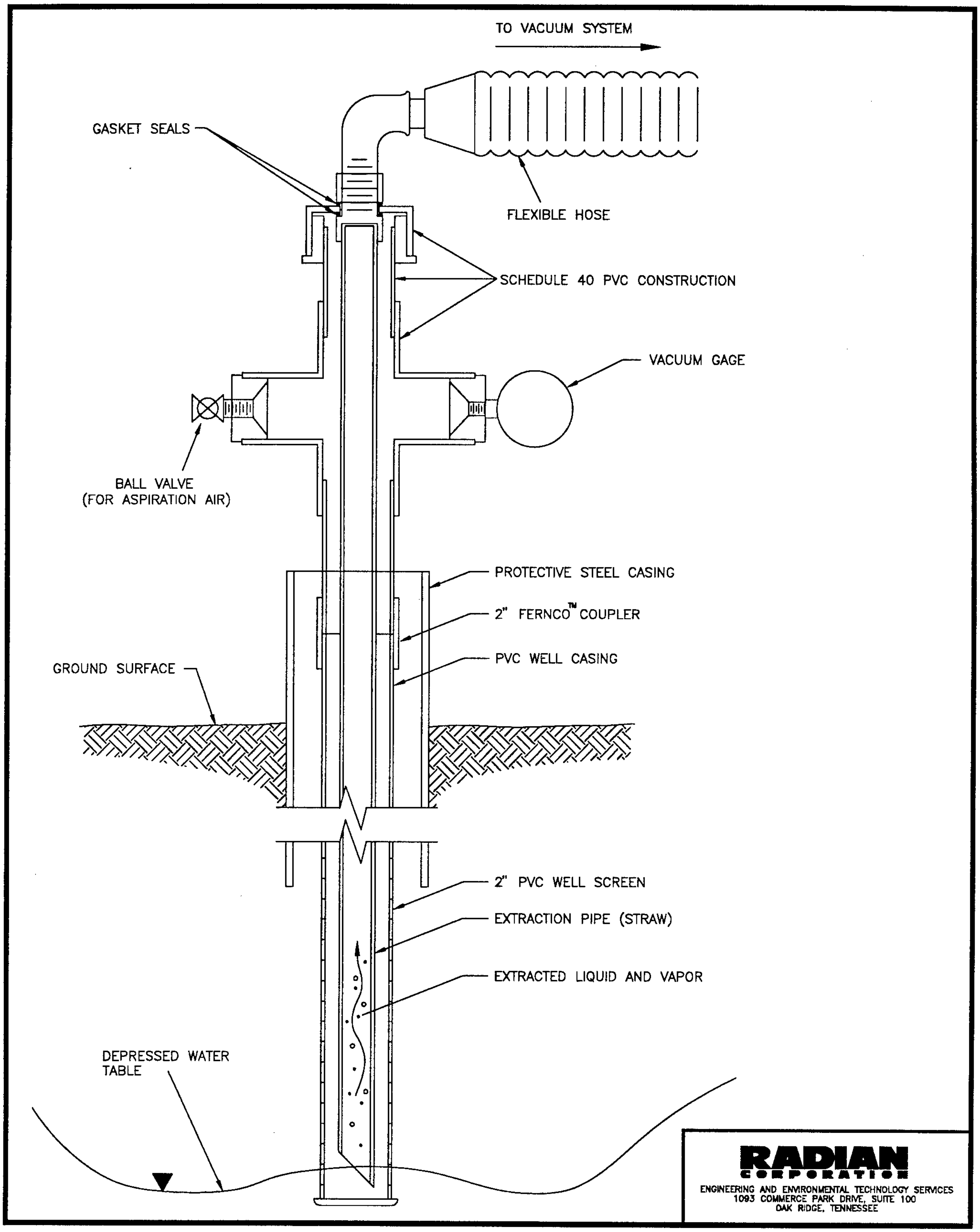

Figure 2-3. Schematic of a 2-Phase™ Extraction Well Configuration

Table 2-2

Frequency of Sample Collection and Source Monitoring

Shedule										
Day	Hour	Ambient Barometric Pressure	Ambient Temperature	Measure Water Level at Test Well	Groundwater Sample from Test Well	Water Levels at Groundwater Piezometers	Effluent Vapor Samples	Induced Vacuum at Soil Vapor Monitoring Probes	System Parameters	Water Samples from Knock-Out Pot
0	Before	X	X	X	X	X				
1	0.25	X	X	X		X	X	X	X	
1	1		X			X	X	X	X	
1	2		X			X	X	X	X	X
1	4		X			X	X	X	X	X
1	8		X			X		X	X	X
2	0	X	X			X	X	X	X	X
2	4		X			X	X	X	X	X
2	8		X			X	*	X	X	X
3	0	X	X			X	X	X	X	X
3	4		X			X	X	X	X	
3	8		X			X	*	X	X	X
4	0	X	X			X	X	X	X	X
4	4		X			X	X	X	X	X
4	4.25			X		X		X	X	
4	4.25			X		X		X	X	X
4	8		X			X	X	X	X	X
5	0	X	X			X	X	X	X	X
5	4		X			X	X	X	X	X
5	4.25		X	X	X					

Note: Groundwater/water samples analyzed for VOCs by Method SW-8260. Vapor samples analyzed for VOCs by Microseeps Analytical Method AM 4.02.

3.0 TEST RESULTS AND CONCLUSIONS

A critical step toward adding another presumptive remedy to the PREECA process is to compare that remedial technology's test results, referred to here as the "site-specific profile," to its PREECA remedy profile and determine the extent to which the two profiles match. The remedy profile comprises the performance data (including site selection criteria, process and methodology descriptions, and the acceptable range of quantitative results) by which the effectiveness of the presumptive remedy will be judged.

Radian performed a four-day test on MW 930101 and a one-day test on the ESVE well. Table 3-1 summarizes the results achieved using the TPE system at MW 930101 and the ESVE well. The results of these two tests are described in Section 3.4.

Table 3-1

Summary of Results

System Parameter	MW 930101	ESVE
Groundwater Extraction Rate	0.22 gpm	0.11 gpm
Soil Vapor Extraction Rate	21–57 scfm	14 scfm[a]
Contaminant Removal Rate	58–122 lb/day	0.07 lb/day
Radius of Influence (Groundwater)	>50 ft	—[b]

[a]Measurement includes aspiration air.
[b]Radius of influence results were inconclusive and will be discussed in Section 3.2.
gpm = gallons per minute
scfm = standard cubic feet per minute

Based on the results of the pilot-scale TPE test conducted at Ellsworth AFB OU-1, Radian has constructed a site-specific profile for OU-1. A comparison of this site-specific profile to the PREECA's TPE remedy profile is presented in Table 3-2. Note that the OU-1 profile compares favorably with the corresponding TPE remedy profile.

3.1 System Operation

Physical and analytical data were analyzed to determine the following:

- Baseline VOC concentrations in groundwater;
- The major VOC constituents in the vapor and water streams;
- Average groundwater and soil vapor extraction rates;
- Average VOC extraction rates and total pounds of VOCs removed;
- The relationship between time and VOC concentrations;
- The relationship between time and vapor and water flow rates; and
- The relationship between distance and groundwater drawdown and induced vacuum, including radii of influence.

3.2 Radii of Influence and Production Rates

The following sections describe groundwater production rates and vapor radius of influence.

3.2.1 Groundwater

The groundwater flow rate was measured using a totalizing flow water meter and is plotted along with the vapor flow rate on Figure 3-1 for both the MW 930101 and ESVE tests. Water table drawdown was measured in piezometers P-1, P-2, P-3, P-7, and P-50 during the tests (Appendix D). A plot of drawdown versus time is presented in Figure 3-2, and a water table contour map for the end of the MW 930101 test is shown in Figure 3-3.

Figure 3-1. Vapor and Liquid Flow Rates

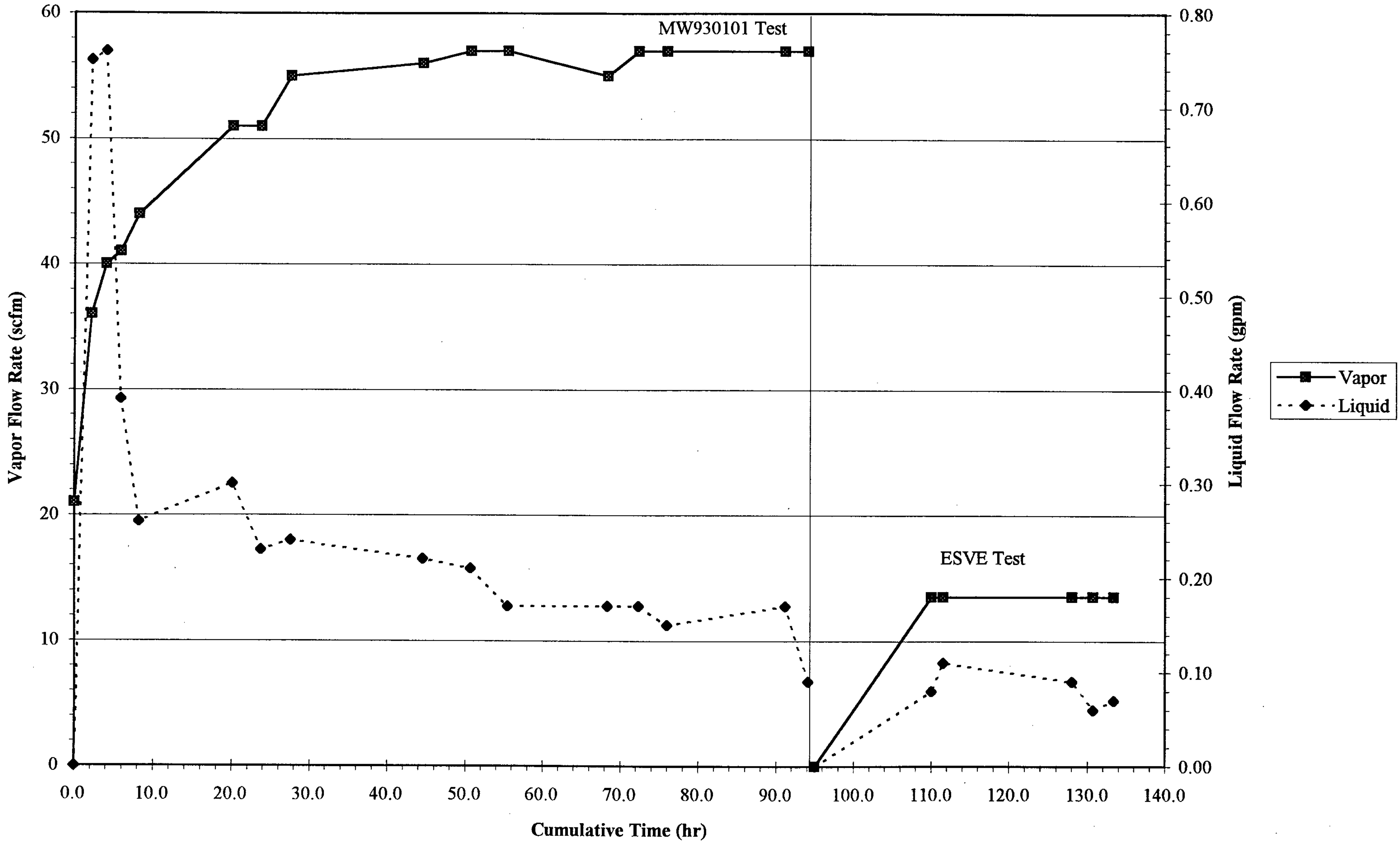

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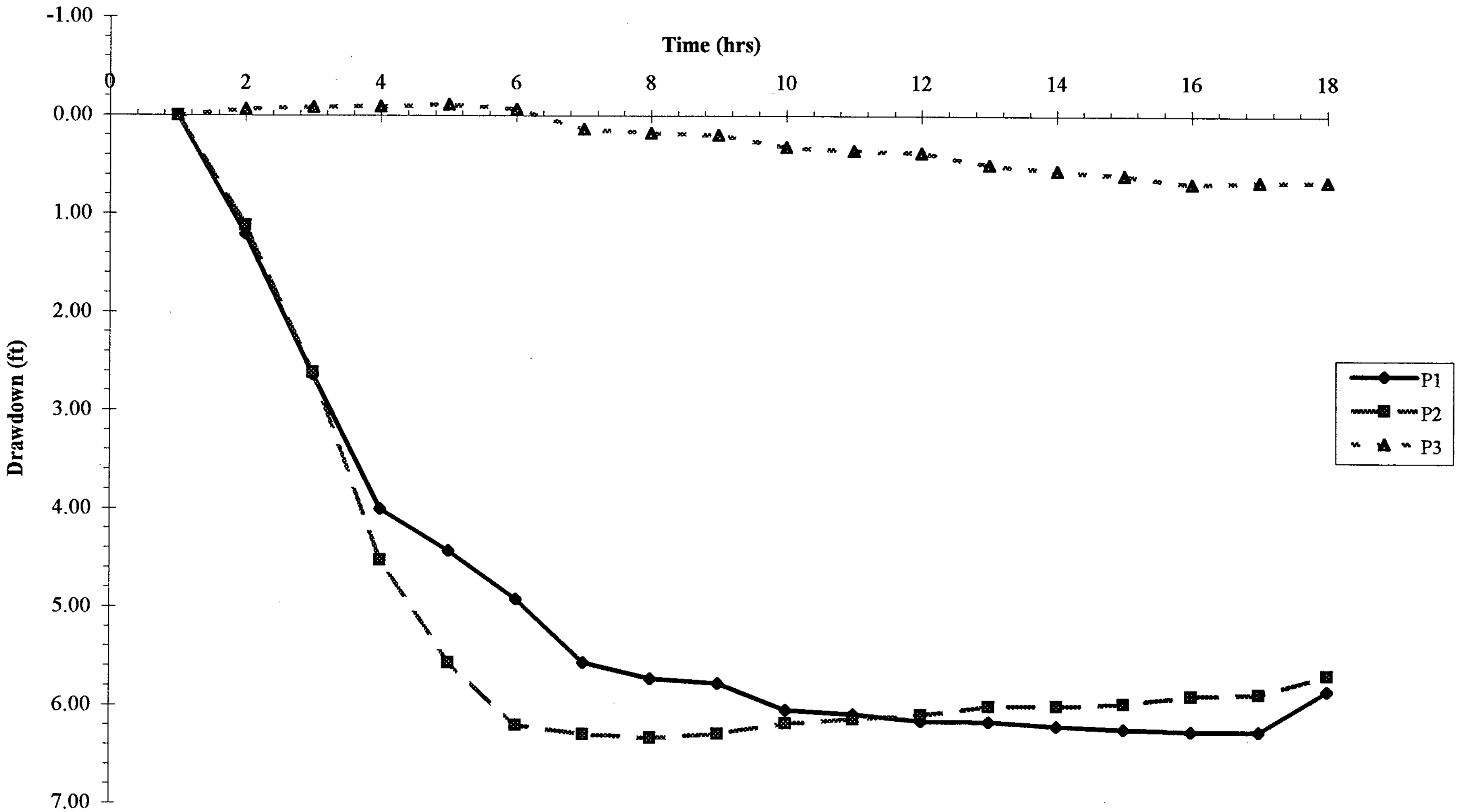
Figure 3-2. Water Level Drawdown Over Time



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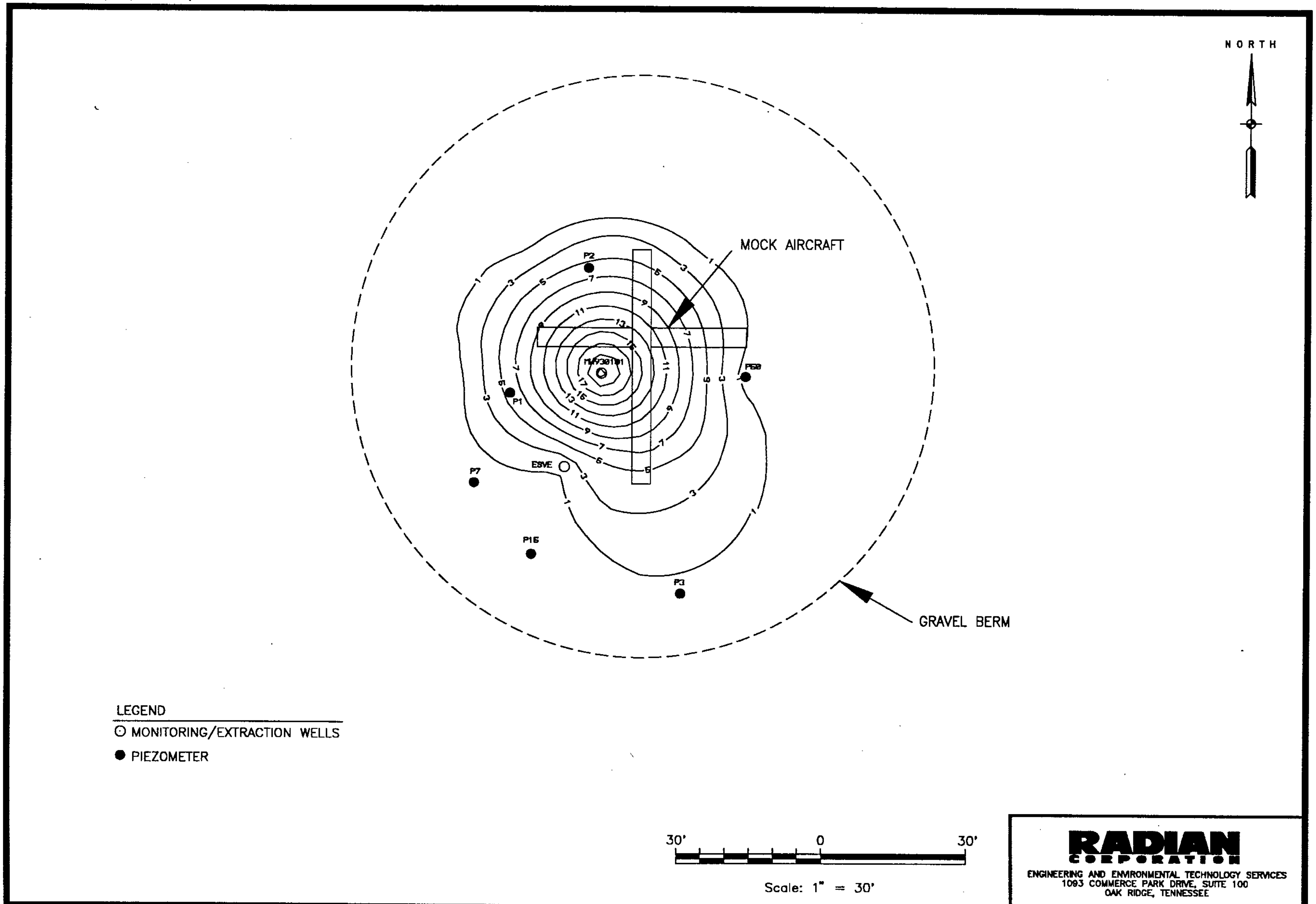

Figure 3-3. Water Level Drawdown Contours

Table 3-2

2-Phase™ Extraction Technology Selection Criteria

Criteria Parameter	PREECA Remedy Profile Guideline	Ellsworth AFB OU-1 Profile
Contaminant	Halogenated VOCs, TPH, and/or BTEX for sites where expedited action is required	Halogenated VOCs, TCE, BTEX, TPH
Contaminant location	Saturated zone or saturated and vadose zone	Saturated and vadose zone
Contaminant concentration	Significantly greater than MCLs	Significantly greater than MCLs for TCE
Depth of contamination	<150 BGS[a]	<43 ft BGS
Henry's Law Constant of majority of contaminants	>0.01 at 20°C (dimensionless)[b]	0.297 at 20°C
Vapor pressure of majority of contaminants	>1.0 mm Hg at 20°C	58 mm Hg at 20°C
Hydraulic conductivity (saturated zone)	<1 x 10^{-4} cm/sec (i.e., silts and clays with minimal interlayered sands and gravels)	9.5 x 10^{-6} cm/sec (weathered and fractured shale)
Groundwater production rate	<15 gpm for 4-in. well casing	<0.5 gpm for a 2-in. well casing
Average air permeability of vadose zone and distribution of contaminants	**Groundwater Only:** *Case 1:* No contamination present in vadose zone. Air permeability in vadose zone is not a determining factor. High concentrations (significantly higher than MCLs) of contaminants in saturated zone. **Vadose Zone and Groundwater Contamination:** *Case 2:* Low to moderate concentrations of contaminants in vadose zone. Low or high air permeability in vadose zone. High concentrations of contaminants in saturated zone. *Case 3:* Low or high air permeability in vadose zone. High concentrations of contaminants in vadose zone and saturated zone. *Case 4:* High concentrations of contaminants in vadose zone. Low air permeability in vadose zone. Low to moderate concentrations of contaminant in saturated zone.	*Case 3:* • Moderate to high concentrations of VOCs in vadose zone and low to moderate concentrations of VOCs in saturated zone, and • Low air permeability in the saturated zone (clays, silts, and shale), and high air permeability in vadose zone (sand, gravel, and silt).

[a]TPE may be implemented at sites where depth of contamination is greater than 150 BGS; however, it has been shown to be more effective when implemented at shallower depths.
[b]Dimensionless Henry's Law Constant in the form: (concentration in gas phase)/(concentration in liquid phase)

AFB = Air Force Base
BGS = Below Ground Surface
BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes
MCL = Maximum Contaminant Level
OU = Operable Unit
TCE = Trichloroethylene
TPH = Total Petroleum Hydrocarbon
VOC = Volatile Organic Compound

During the MW 930101 test, the groundwater flow rate surged at the beginning of the test due to evacuation of the well and sand pack, as well as from dewatering of the sand and gravel deposits near the well. After the initial surge, the water production rate continued to fall slowly during the duration of the test (Figure 3-1). The water production rate fluctuated in the range of 0.16 to 0.20 gpm during the later portion of the test, representing quasi-equilibrium conditions for the test. The radius of influence is estimated to be between 30 and 50 ft based on the available data. The drawdown cone is somewhat asymmetrical with greater drawdowns measured toward the southeast.

During the ESVE test, the groundwater flow rate fluctuated in the range of 0.04 and 0.12 gpm (Figure 3-1). Water table drawdown was also measured in the piezometers at the site during the test. However, the water table actually rose in P-1 and P-2 during test. There are two reasons for the water table rise: (1) the base of the screened interval in the ESVE well was 8.5 ft higher than in MW 930101 and (2) the water table did not have time to return to static conditions prior to starting the ESVE test. Therefore, no conclusions can be reached regarding the radius of influence from the ESVE test.

3.2.2 Vapor

The vapor flow rate was measured using rotometers located at the skid and is plotted along with the vapor flow rate on Figure 3-1 for both the MW 930101 and ESVE tests. Induced vacuum was measured in vapor probes VP-1S, VP-1D, VP-2S, VP-2D, VP-3S, VP-3D, VP-22D, VP-50D and VP-60D (Appendix C). A plot of induced vacuum for the end of the MW 930101 test is shown in Figure 3-4 for the deep vapor probes.

During the MW 930101 test, vapor flow steadily increased during the first 30 hours of the test. The flow rate then stabilized at approximately 57 scfm for the duration of the test. The increase in flow during the first 30 hours of the test occurred as the formation was dewatered and the relative permeability to vapor increased. No aspiration air was required to lift the water from the well; therefore, all vapor flow was from the subsurface. A large pressure drop was maintained in the straw during the test indicating that a higher vapor flow rate might have been achieved in a larger diameter well. The radius of influence of the vapor is greater than 80 ft based on the available data (Figure 3-5).

During the ESVE test, very little, if any vapor flow was generated from the subsurface. Vacuum was not observed in any of the vapor probes, except for VP-3S, during ESVE test (Appendix C). Due to the low permeability of the saturated zone, aspiration air from the surface was required to lift groundwater from the well. It is likely that if the ESVE test were run for a longer time period, more vapor flow would have been generated from the subsurface as the saturated zone was dewatered.

3.3 <u>VOC Recovery</u>

Tables 3-3 and 3-4 summarize analytical results for the VOCs detected in the samples collected during the two tests. BTEX, DCE, ketones, and TCE were the primary contaminants found at the site (see Appendices D and E for the analytical laboratory results and chain-of-custody forms). Results of VOC sampling at MW 930101 included:

- The baseline concentration (before the test) of nonchlorinated VOCs in groundwater from MW 930101 was 2230 μg/L.
- The post-test concentration of nonchlorinated VOCs was 1906 μg/L.
- The nonchlorinated VOC concentration in the extracted water (collected from knock-out pot) averaged 1027 μg/L in the MW 930101 test.
- The total VOC concentration in extracted vapor ranged from 4200 to 7308 ppmv in the MW 930101 test.

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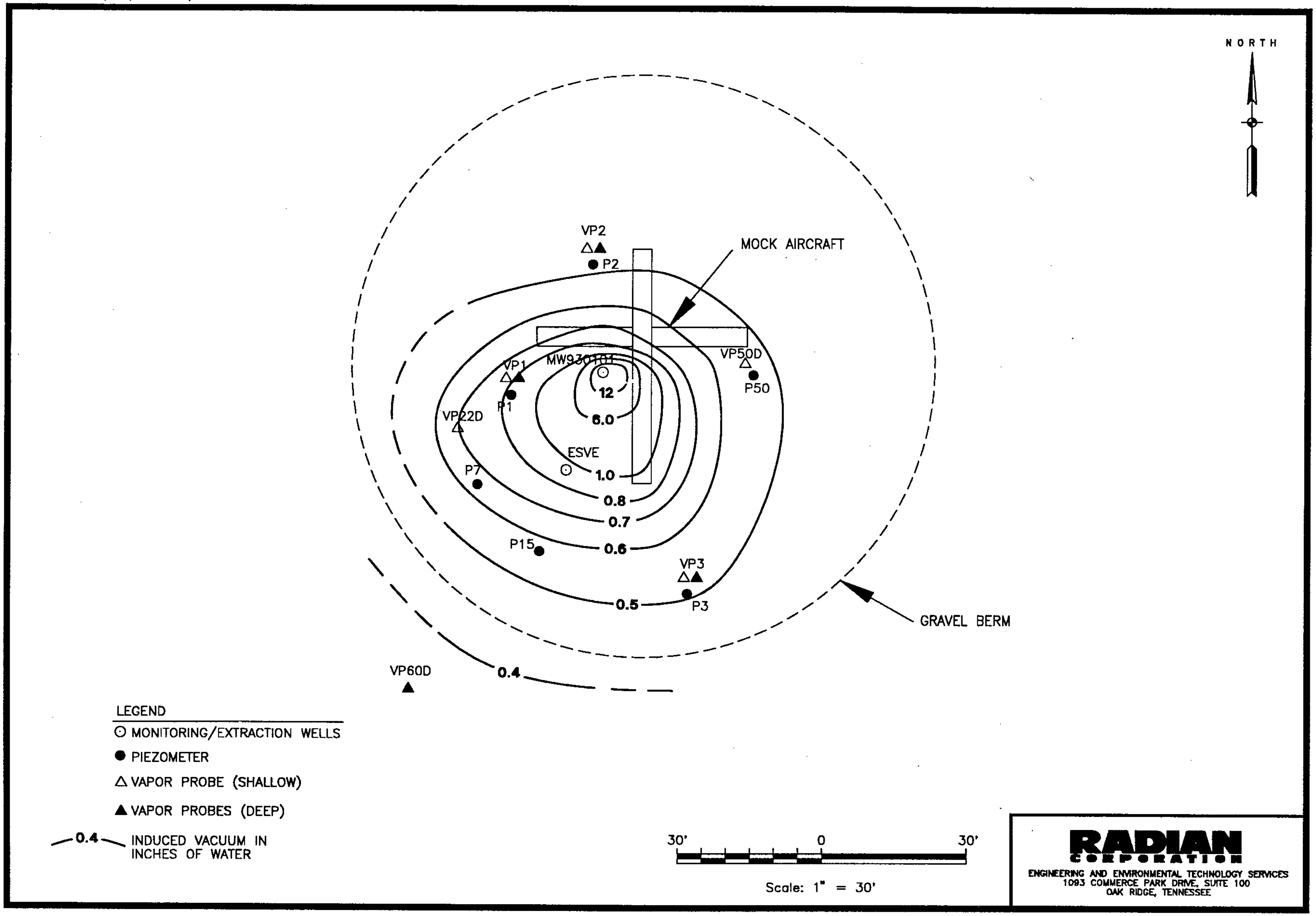

Figure 3-4. Induced Vacuum in Deep Vapor Probes at end of MW930101 Test, Ellsworth AFB

Figure 3-5. VOC Removal Over Time (Water)

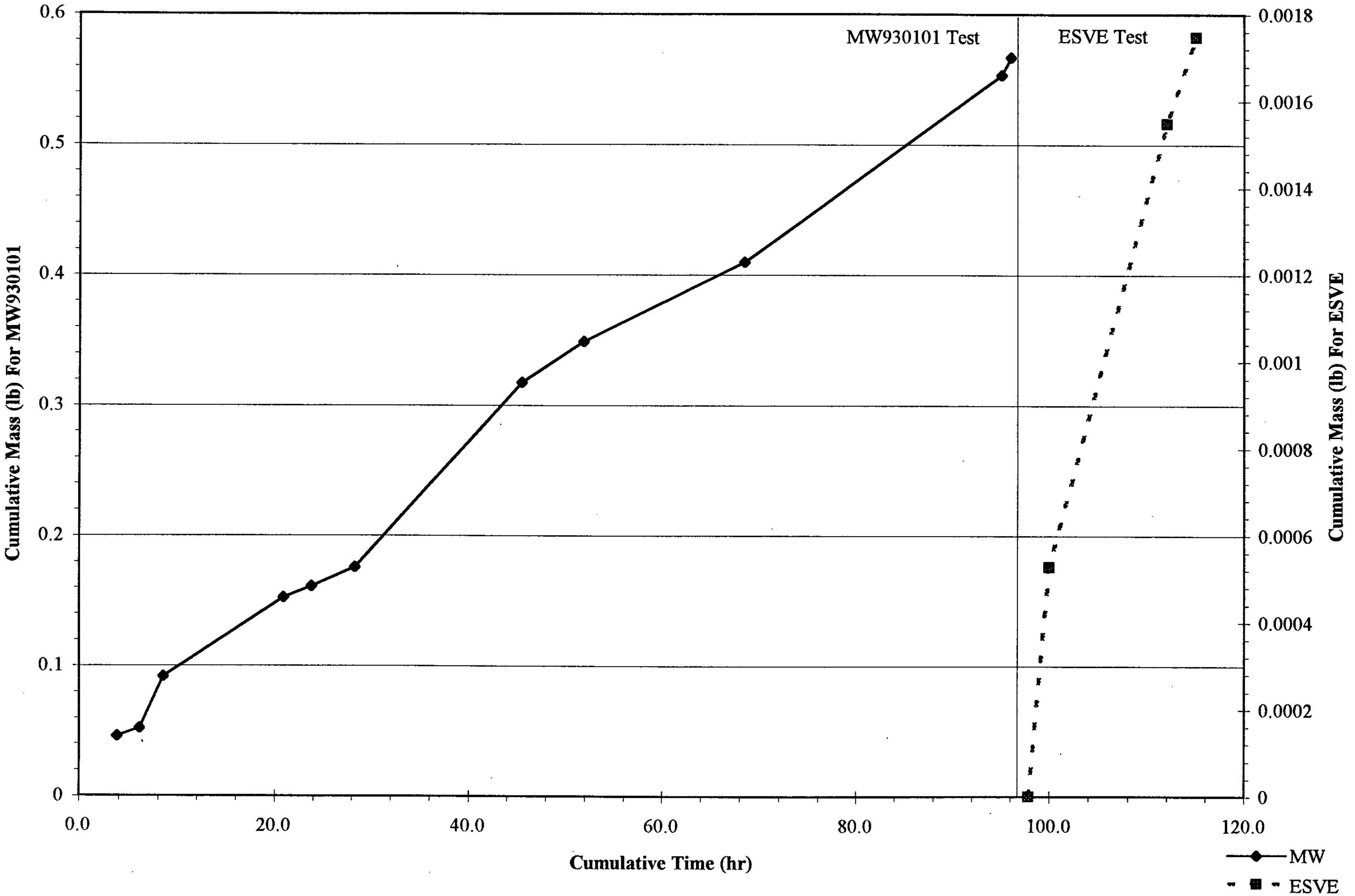

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Table 3-3

Summary of Water Data
Concentration in Micrograms per Liter (µg/L)

Contaminant[a]	Sample ID													
	MW 930101 Test											ESVE Well Test		
	MW 930101 Pre-Test	Influent 1	Influent 2	Influent 3	Influent 4	Influent 5	Influent 6	Influent 7	Influent 8	Influent 9	Influent 11	Influent 12	Influent 13	MW 930101 Post-Test
Acetone	380	—	240	330	400	380	490	740	730	1200	1300	57	—	1300
Benzene	870	220	270	360	330	270	260	290	240	320	230	7.5	1.8	470
2-Butane (MEK)	—	—	—	120	130	130	160	230	220	360	350	78	17	350
cis-1,2-Dichloroethene	3900	700	790	1000	910	790	810	810	700	860	630	63	30	1900
Ethylbenzene	280	65	110	130	150	130	130	130	130	160	130	11	4	56
Toluene	100	28	53	95	130	130	140	180	200	230	180	11	4.1	220
Trichloroethene	18	16	19	26	31	29	28	32	33	44	39	5	6.1	120
m- and p-Xylene	840	180	260	320	390	380	400	440	430	900	420	46	24	1000
o-Xylene	140	13	18	42	50	40	44	82	80	110	120	93	3.3	160
Total purgeable material	45,400	41,300	19,300	112,100	42,600	24,300	28,100	80,500	56,700	41,600	65,600	3,180	1,190	41,500

[a]Only analytes with confirmed hits above detection limits are reported.
Note: All influent samples were taken from the knock-out pot prior to carbon treatment.

Table 3-4

Summary of Vapor Data
Concentrations in Parts per Million by Volume (ppmv)

	Extracted Vapor Concentration							
Sample ID	Benzene	Trichloro-ethylene	Tetrachloro-ethylene	Ethylbenzene	m- and p-Xylene	o-Xylene	Unidentified C5-C10 Compounds	Cis-1,2 Dichloroethylene
V1 (Pre-test)[a]	38	0.6	0.04	1.3	1.1	0.4	3629	61.9
V2	63	1.8	0.15	5.3	9.8	3.5	6351	71.0
V3	67	2.4	0.22	7.0	19	6.2	6933	74.0
V4	67	2.6	0.23	7.2	22	6.8	6785	74.9
V5	73	3.0	0.26	7.3	22	6.7	7194	81.0
V6	68	3.5	0.34	8.5	28	8.7	6750	75.9
V7	61	3.4	0.34	3.3	28	8.9	6255	70.2
V8	59	3.5	0.35	8.1	28	8.7	6079	68.2
V8 Duplicate	54	3.2	0.33	7.6	26	8.4	5586	63.2
V9	50	3.7	0.42	8.3	29	9.2	5386	60.1
V10	41	3.1	0.37	7.3	27	8.8	4430	47.7
V11	50	4.1	0.52	8.7	32	10	5355	57.0
V13	38	3.6	0.52	7.3	30	10	4268	44.5
V14 (Post-test)[a]	40	3.6	0.36	4.3	16	4.7	3936	49.3
V15[b]	0.26	0.012	0.010	0.21	1.40	0.82	52	0.2
V15 Duplicate[b]	0.25	0.010	0.009	0.19	1.29	0.82	49	0.2
V16[b]	0.25	0.006	0.005	0.07	0.08	0.07	9	0.1

[a]Samples taken of extracted soil gas only with the straw above the water table.
[b]Samples taken during the test on the ESVE well.

BTEX and chlorinated compounds were detected in the groundwater and vapors collected from the ESVE well, but at greatly reduced concentrations compared to MW 930101. The lower concentrations were attributable to the elimination of air flow from the highly contaminated vadose zone. Results of VOC sampling at the ESVE well included:

- The concentration of nonchlorinated VOCs in the extracted water at the start of the ESVE well test was 170 μg/L.
- The concentration of nonchlorinated VOCs in the extracted water at the end of the ESVE well test was 37 μg/L.
- The total VOC concentration in the extracted vapor averaged 30 ppmv in the ESVE well test.

3.3.1 Extraction Results

Results of the MW 930101 test included:

- Approximately 428 lb of total VOC compounds were extracted from MW 930101 in 96 hours of testing (i.e., approximately 100 lb/day). The vast majority of the compounds were extracted in the vapor phase.
- Average groundwater extraction rate was 0.2 gpm.
- Average vapor extraction rate from the formation was 50 scfm.
- The TPE extraction system transferred over half of the VOCs in the groundwater to the vapor phase, resulting in decreased concentrations in the water phase and reduced treatment cost.
- A small amount of product (LNAPL) was found in the first carbon drum following the test. The material was extracted from the saturated zone or capillary fringe. The presence of this product in the liquid phase likely increased the concentration of VOCs in the effluent samples. A much greater stripping effect would have likely been measured without this product.

Results of the ESVE well test included:

- Average groundwater extraction rate was 0.1 gpm.
- Average vapor extraction rate was approximately 13 scfm.
- Approximately 0.1 lb of total VOCs were extracted from the ESVE well in 24 hours.

3.3.2 VOC Removal Over Time

Graphs showing VOC removal over time at the two test wells are provided in Figures 3-6 and 3-7. In general, steady concentrations in both extracted vapor and water were achieved after approximately 20 hours of testing. Average off-gas vapor and effluent water concentrations for the MW 930101 test were:

- 26,000 ppbv nonchlorinated VOC in extracted vapor and
- 1906 μg/L nonchlorinated compounds in extracted groundwater.

Average off-gas vapor and effluent water concentrations for the ESVE well test were:

- 2,690 ppbv nonchlorinated compounds in extracted vapor and
- 172 μg/L nonchlorinated compounds in extracted groundwater.

Ninety-three percent of the total VOCs removed were from the vapor phase and the remaining seven percent were in the water phase.

3.4 Conclusions

The two tests conducted at OU-1 produced very different results that provided valuable information on the application of TPE that a more traditional test would not have provided.

Figure 3-6. VOC Removal Over Time (Vapor)

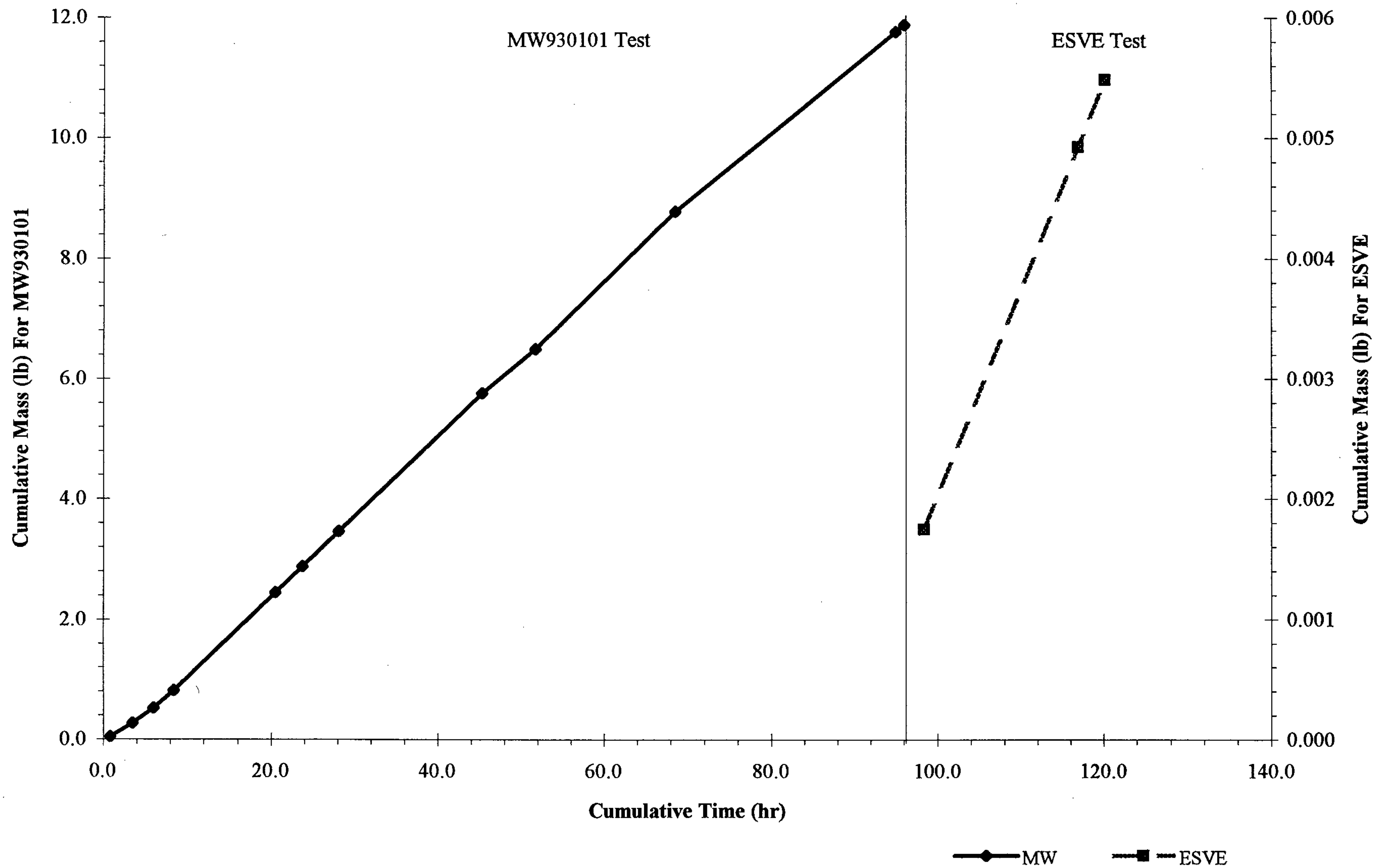

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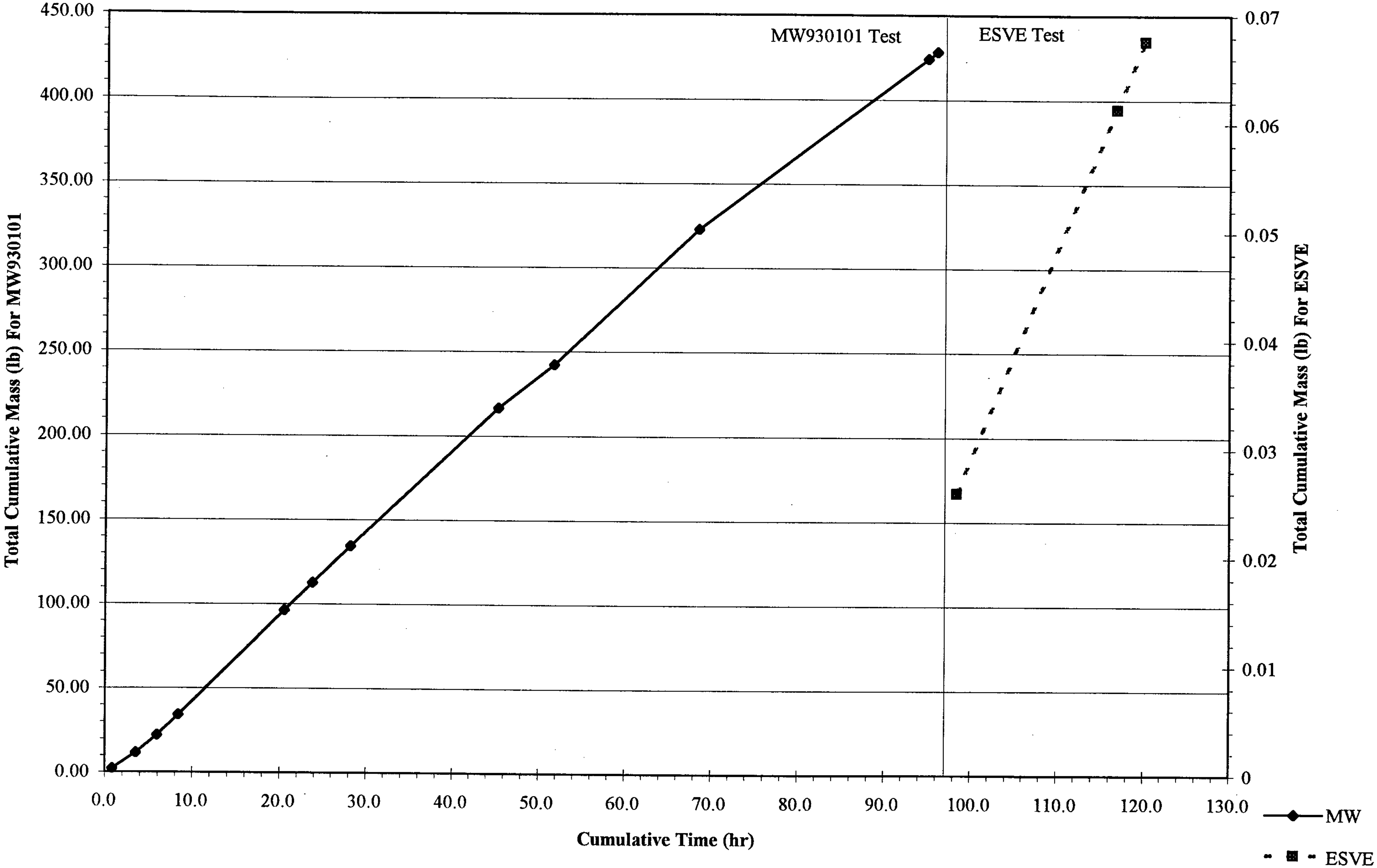
Figure 3-7. Total Mass of VOCs Removed Over Time (water and vapor)



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The conclusions from each test are discussed below and are followed by overall conclusions.

3.4.1 MW 930101 Test

The TPE test on MW 930101 demonstrated that TPE is effective in simultaneously removing volatile contaminants from both the vadose zone and groundwater. Approximately 100 lb/day of VOCs were removed during the 96-hour test, primarily from the unsaturated zone (vadose zone).

An average flow rate of 0.2 gpm and a drawdown of 26.4 ft were generated during the TPE test. A small amount of product was also extracted during the test. Well MW 930101 has a 32.5-ft screen that was open across both the saturated zone and vadose zone (10 to 42.5 ft BGS, water table 15.6 ft BGS) (see Figure 1-2). The saturated zone consists primarily of low permeability weathered and fractured shale (estimated hydraulic conductivity of 9.5×10^{-6} cm/s) (EA Engineering 1994a).

A vapor flow rate of up to 57 scfm was generated from the formation during the TPE test under a well head vacuum that decreased from 11 to 1 in. mercury during the test. These vapor flow rates compare with vadose zone rates of between 60 and 125 cfm generated during the previous SVE test at the site. The unsaturated zone at the site consists primarily of a mixture of sand and gravel fill of moderately high permeability (200–400 Darcy) (EA Engineering 1994b). Therefore, it appears that the majority of the vapor flow into the well was from the sand and gravel fill interval in the vadose zone.

Because of the relatively high vapor flow rates (for a TPE test), no aspiration air was required to lift the groundwater through the straw. An advantage of this is that vapor concentrations are not diluted by aspiration air. This maximizes the air flow through the formation and also increases the cost-effectiveness of vapor treatment. Performance at this high vapor flow was hindered by the 1-in. diameter straw. This caused a large head loss and concomitantly low vacuum applied at the formation (approximately 1 in. mercury). The straw diameter was limited by the well diameter (2 in.). A larger well diameter would allow a larger straw diameter, which would increase the vacuum on the formation.

3.4.2 ESVE Well Test

The short duration (24-hour) TPE test on the ESVE well demonstrated that VOCs could be effectively removed from groundwater in the tight saturated zone formation.

The average groundwater flow rate from ESVE was approximately 0.11 gpm, although this is only 50% of the flow rate obtained from MW 930101, it is similar to flows obtained near the end of the test. Also, the well screen in the ESVE well is located entirely within the weathered and fractured shale in the saturated zone and was effectively isolated from the permeable alluvium in the vadose zone (24 to 34 ft BGS) (see Figure 1-2). The placement of the 10-ft long well screen in ESVE resulted in a drawdown of 17.9 ft. The resulting lower extraction rate in ESVE compared to MW 930101 was a result of the shorter well screen and 8.5 ft less of drawdown.

The vapor phase flow from the well was 14 scfm during the test under a well head vacuum of 20 in. mercury. The majority of vapor-phase flow was aspiration air. Aspiration air was required since vapor flow from the formation was low during the brief test period, and air was required to lift the groundwater and create two-phase flow in the straw. Air flow from the formation would likely increase, and aspiration air could be reduced over time as the system dewaters the weathered and fractured shale and flow pathways open up. The short duration of the test did not allow sufficient time to fully evaluate this effect.

The contaminant removal rate from ESVE during the short duration of the test was approximately 0.07 lb/day. Because the well screen was isolated from the vadose zone, the contaminants removed during this portion of the test were exclusively from the saturated zone.

3.4.3 Overall Conclusions

The TPE tests were conducted in extraction wells located within the former FPTA burn pit. The first portion of the test demonstrated that TPE could be used to simultaneously remove VOCs from contaminated soils in the vadose zone and VOCs from the groundwater. Some liquid hydrocarbon product was also removed. The second portion of the test demonstrated that VOCs could also be effectively removed from contaminated groundwater without pulling significant amounts of vapors from the vadose zone. It also confirmed that the majority of contamination is present in the permeable vadose zone but that there is significant recoverable contamination in the tight saturated zone. The selection of the well screen location can be used effectively as a design criterion depending upon the results desired. The low groundwater flow rate suggests that a conventional pump and treat system, which relies strictly on gravity flow, would not likely be cost-effective at recovering significant quantities of groundwater and contaminants at this site. Conventional SVE, which uses low vacuum, would likely be effective at removing a significant mass of contaminants from the gravel fill in the vadose zone. SVE would have no impact on the saturated zone contamination. Dual phase extraction, which combines SVE with pump and treat, would not likely gain much over straight SVE within the source area. However, pump and treat would likely be effective as a long-term strategy to control groundwater plume migration at the downgradient edge of the plume.

The test results suggest that a TPE removal action focused on the primary area of contamination would be very successful. A 4-in. diameter TPE well with a 10-ft screen length targeting the saturated zone and capillary fringe zone would be very effective at extracting groundwater and VOCs from the saturated zone and deep vadose zone. The capillary fringe is an area between the water table and unsaturated zone, which is frequently a major source of contamination when fuel hydrocarbons are present. This would likely achieve a significant mass removal rate of subsurface VOCs, especially in the source area.

It also suggests that at this site TPE plus SVE, or a nested TPE system (multiple wells screened in different zones), could remove significant quantities of VOCs from both the saturated zone and the vadose zone, which is also contaminated and is more permeable. This combination of technologies would be most likely to achieve overall remedial goals for the site.

4.0 ELLSWORTH AFB REMEDIAL ACTION ENHANCEMENT

Ellsworth AFB has produced the feasibility study for OU-1 and is in the process of drafting the proposed plan and record of decision. Ellsworth AFB has chosen to implement early actions to address the further spread of contamination from this operable unit. The preferred alternative for an interim remedial action (IRA) at this site is a combination of SVE and groundwater pump and treat, or dual-phase extraction. This was based on the data from two previous treatability studies; a groundwater recovery and treatment system (1990) and an SVE pilot test (1994).

The Final Remedial Design Work Plan for OU-1 states that the overall strategy at the site is to control migration of contamination in the former FPTA and extract and treat contaminated groundwater downgradient of this source.

The IRA currently under design for OU-1 combines SVE and groundwater pump and treat. The groundwater component of this system is primarily focused on migration control by intercepting the plume downgradient of the source area. The SVE component will address much of the vadose zone contamination, particularly in the gravel fill placed in the fire pit area when the FPTA was constructed. The Final Design Analysis for OU-1 states that the system will not address portions of the deep vadose zone in native silty clay, which underlies the fill and may be a significant source of vadose zone and groundwater contamination.

A TPE system could enhance the IRA at OU-1 by addressing the groundwater and contaminated capillary fringe zone as well as the deep vadose zone in the source area on an accelerated schedule. The combination of the current IRA and the TPE system could have a synergistic effect that would likely be more effective than either could accomplish alone. The pump and treat should be effective in controlling downgradient migration, and the SVE should be effective in remediating the shallow vadose zone. Also, an SVE well can cause upwelling of the groundwater around the well. The upwelling can interfere with the SVE in some cases, particularly if the well screen is close to the water table, as is the case at this site. With TPE operating concurrently, it will draw the water table down from the SVE wells. This would dewater and expose more sediments to air, increasing the efficiency of the SVE.

The TPE system would likely achieve a much higher mass removal of contaminants in the fractured and weathered shale (saturated zone) than could be achieved with a conventional pump and treat system. It would also remove any product floating on the water table or trapped in the capillary fringe. It could remediate the shale and deep overlying material in a relatively short period of time. This would remove the source of groundwater contamination and reduce the length of time required to operate the IRA for migration control in the downgradient plume area. The TPE system could be operated concurrently with the IRA.

The cost of a full-scale TPE system (50 hp) at the FPTA is estimated at $100,000–$200,000 capital cost. At OU-1, the IRA includes both water and vapor collection and treatment systems. If the TPE was added on to this system, significant cost savings would result, and a cost in the low end of that range would be likely. Similarly, if TPE is added on to the existing system, operation and maintenance (O&M) cost would be limited primarily to the cost of electric power. The estimated O&M cost for such a system is $30,000–$50,000 per year. This cost would likely only be incurred for 1 to 5 years, as opposed to typically 30 years for a pump and treat system.

As suggested by the EPA, the TPE technology may be useful for removal actions and remedial actions at other locations at Ellsworth AFB where site characteristics match the requirements for the technology (Appendix A). The PREECA TPE selection criteria shown in Table 3-2 fit the profile of many sites at Ellsworth AFB. In particular, OU-11 (Basewide Groundwater) contains several sites with fuel hydrocarbon

and/or chlorinated VOCs. Site BG-04 (Hooterville Plume), which has a significant TCE plume extending off base, and OU-9 (Auto Hobby Shop), which contains fuel hydrocarbons in groundwater, may also be good candidate sites.

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APPENDIX A

EPA Region VIII Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

Post-It® Fax Note 7671	Date	# of pages ▸
To BILL BUCHANS	From D. PETERSEN	
Co./Dept.	Co.	
Phone #	Phone # 605-385-2675	
Fax # 615-483-9061	Fax # 605-385-6619	

Ref: 8HWM-FF

Dell S. Peterson, PE
Installation Restoration Program Manager
28 SPTG/DEVR
Ellsworth AFB, South Dakota 57706-5000

Subject: Presumptive Remedy Engineering Evaluation/Cost Analysis (PREECA); 2-Phase Pilot Test Evaluation Report.

Dear Mr. Peterson:

The presentation at your offices regarding the PREECA document and the 2-Phase extraction technology was very informative. I have read both documents and offer some comments for the use of the documents at Ellsworth.

PREECA

1. This "plug-in" EE/CA would be a useful tool for accelerating non-time-critical (NTC) removal actions at Ellsworth Air Force Base. Certain sites within and outside of designated operable units (ous) may qualify for a removal action. For sites within OUs, we must evaluate the time savings of performing removal actions given the current stage of the remedial action.

2. The technologies listed in the PREECA document may be applicable to certain sites at Ellsworth. As stated during the presentation, we still must evaluate the cost effectiveness of the technologies based on the site-specific characteristics (e.g. capital costs vs. operation and maintenance costs).

3. The "plug-in" approach and the PREECA document would be useful for non-CERCLA cleanup actions. Underground Storage Tank (UST) cleanup projects across the Base seem to have similar cleanup characteristics. The PREECA document could be used as the technology evaluation document (i.e. Corrective Measures Study Report), with the State's approval, to make remedy selection decisions.

4. The phrase "relative risk" is used throughout the document. Using the word "relative" may be misleading. At a facility with all low risk sites, one of the sites at the facility will have high risk, relative to the other sites, but still be low risk.

APPENDIX B

Well and Drilling Logs

RADIAN CORPORATION

GROUNDWATER SAMPLING RECORD

WELL NUMBER: MW930101
DATE/TIME: 6-23-95 / 1120
PROJECT/NUMBER: 612-001-31-37

LOCATION: Ellsworth AFB OU-1
WEATHER: Sunny, Windy 60°F
SAMPLER(S): Gary Dyke

FIELD MEASUREMENTS

OVM/OVA READING (ppm): 2
DEPTH TO WATER BELOW TOC (ft.): ~~19.36~~ 19.39
WATER COLUMN HEIGHT (ft.): 24.52
CASING DIAMETER (ft.): ~~2½~~ 2" = 0.167 ft
ACTUAL PURGE VOLUME (gal.):
PURGING MEASUREMENT METHOD: Bucket

PRODUCT DEPTH (ft.): —
WELL DEPTH BELOW TOC (ft.): 43.91
PRODUCT THICKNESS (ft.): —
3 WELL VOLUMES (gal.): 48
DECONTAMINATION METHOD: Alcanox and distilled water

PURGING METHOD: Bailer: ☐ PVC ☐ Stainless Steel ☑ Teflon ☐ Polyethylene
Pump: ☐ Submersible ☐ Bladder

SAMPLING METHOD: Bailer: ☐ PVC ☐ Stainless Steel ☑ Teflon ☐ Polyethylene
Pump: ☐ Bladder

Time 23 Jun 95	Cumulative Volume Purged (gal.)	pH	Conductivity (µmhos/cm)	T (°F)	Comments (Water clarity, odor, well conditions, etc.)
0959	~2.5	7	1.00	52°	Gray / Silt present
1015	~7.5	7.5	1.06	56°	~~Slightly~~ Gray
1030	~14.5 gal	7.5	1.00	54°	Gray Stop to allow well to recharge.
1100	~17.0	7.5	1.00	56°	Gray + Silty
1115	~22.0	7.5	1.00	54°	Gray + Silty

SAMPLES

ID #	Matrix	Container	Preservative	Filtered (Y/N)	Analytical Method
MW930101	Water	3×40ml VOA	HCl	N	8260

COMMENTS / CALCULATIONS 3 Well Volumes (gal) = 3π (radius in ft)^2 (water column height in ft) (7.48 gal/ft^3 water)

SAMPLERS SIGNATURE(S) [signature]

DRILLING LOG

HOLE NO. P-1	SHEET 1 OF 1 SHEETS 3	
1. COMPANY NAME Radian	2. DRILLING SUBCONTRACTOR Huntingdon	
3. PROJECT Ellsworth AFB 2-Phase Test	4. LOCATION OU-1	
5. NAME OF DRILLER Kenneth Diers	6. MANUFACTURER'S DESIGNATION OF DRILL CME	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 3-inch ID HSA 5 ft, 2½-in core barrel	8. HOLE LOCATION 10 ft from MW930101	
	9. SURFACE ELEVATION	
	10. DATE STARTED 6-20-95	11. DATE COMPLETED 6-20-95
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED 20 ft	
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE 45 ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
None			None

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
None						

22. DEPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Completed as Piezometer		✓		[signature]

GRAPHIC LOG a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	SAMPLE INTERVAL f	RECOVERY g	REMARKS h
	0–1	Tan (5Y 7/2) Clayey gravel, sandy. Olive Blk (5Y 2/1) Poorly sorted, loose, surface gravel at FTA			0-5 ft.	2.4 ft	BZ=0
	1–2	Clayey gravel, sticky, dry Very poorly sorted, HC odor.	SA= 138				
	2–6	Brown (10YR 5/4) to Dark Yellowish orange (10YR 6/6) Sandy gravel, very poorly sorted, subround pebbles to 3-inches in diameter, occassionally silty and clayey (<10%), occassional caliche (not cemented), loose, Unconsolidated and dry.					BZ=1 BZ=3
	5–10		SA=1		5-10 ft	2.0 ft	BZ=1

PROJECT 612-001-31-37 HOLE NO. P-1

SA= Sample screen with PID in ppm.
BZ= Breathing zone PID measurement in ppm.

DRILLING LOG

HOLE NO. P-1

PROJECT Ellsworth AFB 2-Phase Test | INSPECTOR Gary Dyke | SHEET 2 OF 3 SHEETS

GRAPHIC LOG a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	SAMPLE INTERVAL f	RECOVERY g	REMARKS h
	10–15	As above Sandy gravel	SA=3		10-15 ft.	2.4 ft.	BZ=3
	15–16.5	Brown to Black, Clayey gravel, poorly sorted, subround pebbles, moist.			15-20 ft.	2.6 ft.	
	16.5–20	Light Olive Gray, clay (weathered Pierre Shale) mottle color with some yellow-brown, sticky, moist. (5Y 5/2)					
	20–25	Light Olive Gray, fractured silty clay, grades into unfractured clay at about 22 ft, mottled coloring with dark yellow orange (10 YR 6/6) and greenish black (5G 2/1), where unfractured it is sticky and cohesive, minor amounts of fine sand and silt.	SA=30		20-25 ft	4.0 ft.	BZ=3
	25–30	same to 30 ft			Cuttings only		

PROJECT 612-001-31-37

HOLE NO. P-1

DRILLING LOG

HOLE NO. P-1

PROJECT Ellsworth 2-Phase test | INSPECTOR Gary Dyke | SHEET 3 OF 3 SHEETS

GRAPHIC LOG a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	SAMPLE INTERVAL f	RECOVERY g	REMARKS h
	~~10~~ 30	As above. Silty clay. Fractured from 30 to 31.6	SA=2	30-35 ft.	3.9 ft.		BZ=3
	~~15~~ 35				Cuttings only		BZ=3
	~~20~~ 40	Greenish black (5G 2/1), clay to slightly weathered Pierre shale.			Cuttings only		
	~~25~~ 45	Total Depth=45ft.					

PROJECT 612-001-31-37

HOLE NO. P-1

SINGLE COMPLETION WELL CONSTRUCTION LOG

Well Number: P-1

Project: Ellsworth 2-Phase Test

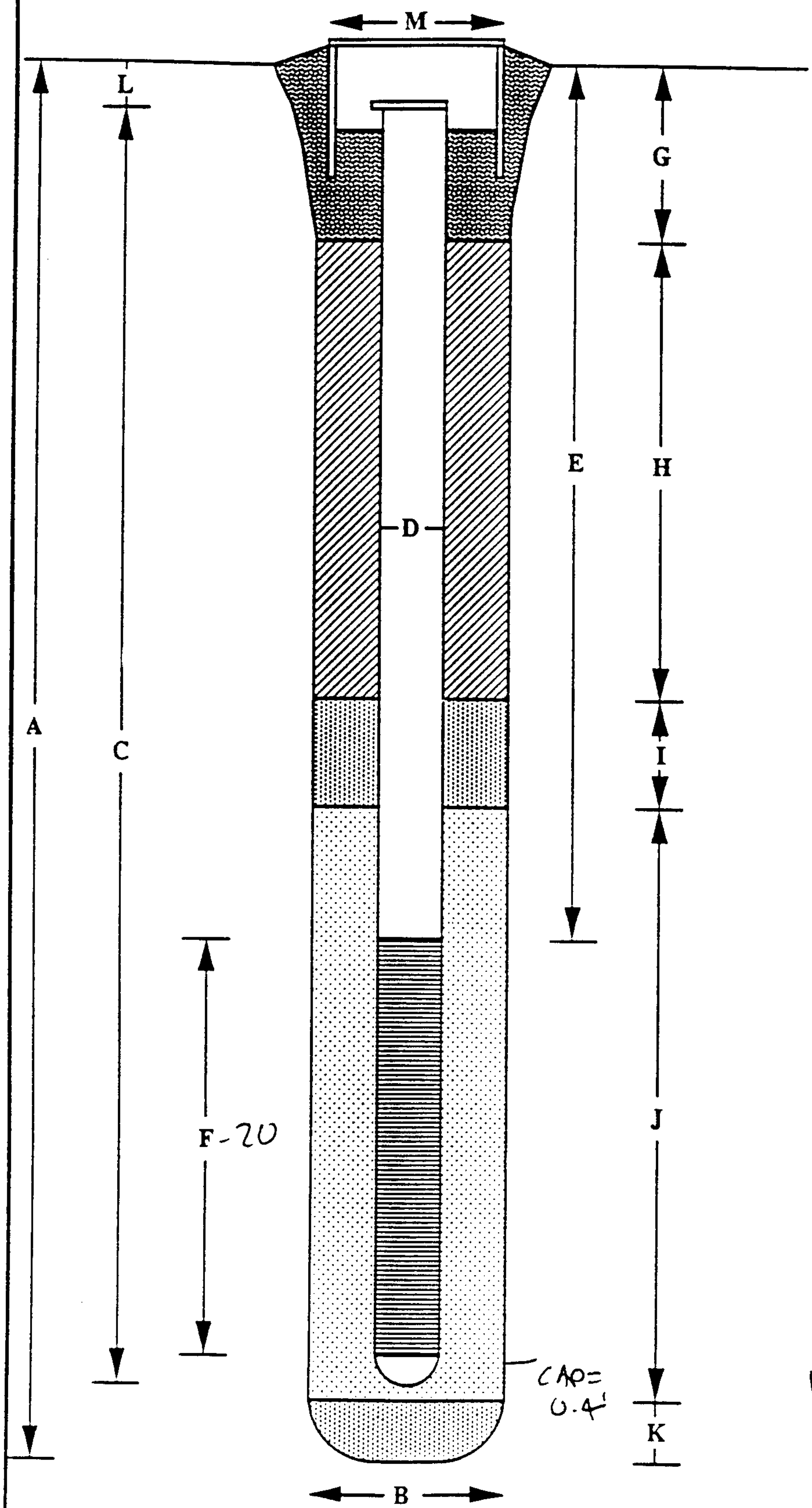
Project Number: 612-001-31-37

Location: OU-1

Datum:

Top of Casing Elevation:

Ground Surface Elevation:



BORING

A. Total Depth (ft): 44.5

B. Boring Diameter (in.): 7¼

Drilling Method: HSA

WELL CONSTRUCTION

C. Casing Length (ft):

Type: 2-inch PVC

D. Casing Diameter (ft): 2

E. Depth to Top of Slotted Interval (ft):

F. Perforated Casing Length (ft): 20'

Perforated Interval From 44 to 24 ft

Perforation Type: slotted 0.010

Perforation Size: 0.01

G. Surface Grout Interval (ft):

Grout Material:

H. Backfilled Interval (ft):

Backfill Material: NA

I. Sealed Interval (ft):

Seal Material: Bentonite Granular

J. Filter Pack Interval (ft): 44.5-21.5

Pack Material: 10/20

K. Bottom Seal Interval (ft): NA

Seal Material:

L. Depth to Top of Casing (in):

M. Protective Casing Diameter (in): NA

10½ bags silica sd.

DRILLING LOG

HOLE NO. P-2	SHEET 1 OF 1 SHEETS 3	F3248

1. COMPANY NAME Radian	2. DRILLING SUBCONTRACTOR Huntingdon
3. PROJECT Ellsworth AFB 2-Phase Test	4. LOCATION OU-1
5. NAME OF DRILLER Kenneth Diers	6. MANUFACTURER'S DESIGNATION OF DRILL CME
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 7½" OD, 3" ID ~~PIAS~~ HSA, 5 ft split core barrel	8. HOLE LOCATION 25 ft. from MW930101
	9. SURFACE ELEVATION
	10. DATE STARTED 6-20-95 / 11. DATE COMPLETED 6-20-95
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14. TOTAL DEPTH OF HOLE 45 ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NONE			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NONE						

22. DEPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
Completed as Piezometer		✓		[signature]

GRAPHIC LOG a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	SAMPLE INTERVAL f	RECOVERY g	REMARKS h
	0–1.5	Olive black (5Y 2/2) to brown sandy clay, cobbles, odor, moist friable, poorly sorted	SA=220		0-5 ft.	1.5 ft.	BZ=3
	1.5–5	Olive Gray (5Y 5/2) sandy clay with occasional pebble + cobbles to ½-inch diameter, pebbles are sub-round, odor.					
	5–7	Brown, clayey-silty-gravel, very poorly sorted, cobbles to 3-inch dia., light caliche, subrounded, moist to dry	SA>2,000		5-10 ft	2.3 ft.	BZ=5
	7–10	Olive gray to brown, fine, silty sand moderate to well sorted, moist					BZ=2

PROJECT 612-001-31-37 HOLE NO. P-2

SA= Sample screen with PID in ppm.

BZ= Breathing zone sample with PID in ppm.

DRILLING LOG

HOLE NO. P-2

PROJECT Ellsworth AFB 2-Phase Test | INSPECTOR Gary Dyke | SHEET 2 OF 3 SHEETS

GRAPHIC LOG a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	SAMPLE INTERVAL f	RECOVERY g	REMARKS h
	10–15	Brown, sandy gravel, poorly sorted, medium to coarse sand, subrounded, numerous pebbles and cobbles, slight odor	SA= 160		10-15 ft	1.4 ft.	BZ = 4
	15–18	Wet at 15 ft. Product-like sheen, strong odor.	SA= 400		15-20	1.0 ft.	BZ = 6-10
	18–20	— — — — — — —					Weathered shale contact based on drilling.
	20–25	Light olive gray, <u>clay</u> (weathered Pierre Shale), variable, mottled coloring, brown + gray + olive gray, sticky.		SA= 96	20-25	3.0 ft.	BZ = 3-6
	25–30	Core barrel wet		SA= 184	25-30	2.0 ft.	BZ = 1-10

PROJECT 612-001-31-37

HOLE NO. P-2

DRILLING LOG

HOLE NO.	P-2
PROJECT	Ellsworth 2-Phase Test
INSPECTOR	Gary Dyke
SHEET 3 OF 3 SHEETS	

DEPTH	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX NO.	SAMPLE INTERVAL	RECOVERY	REMARKS
~~10~~ 30	Olive gray clay. As above.			No Samples		
~~15~~ 35				No Samples		BZ= 3-7
~~20~~ 40	Dark Greenish Black (5G 2/1) shale. Fractured along bedding planes, dry, friable.	SA=10		40-45	5.0 ft.	BZ-2 BZ=2
~~25~~ 45	Total Depth 45 ft.					

SINGLE COMPLETION WELL CONSTRUCTION LOG

Well Number: P2

Project: Ellsworth AFB 3-P. Test

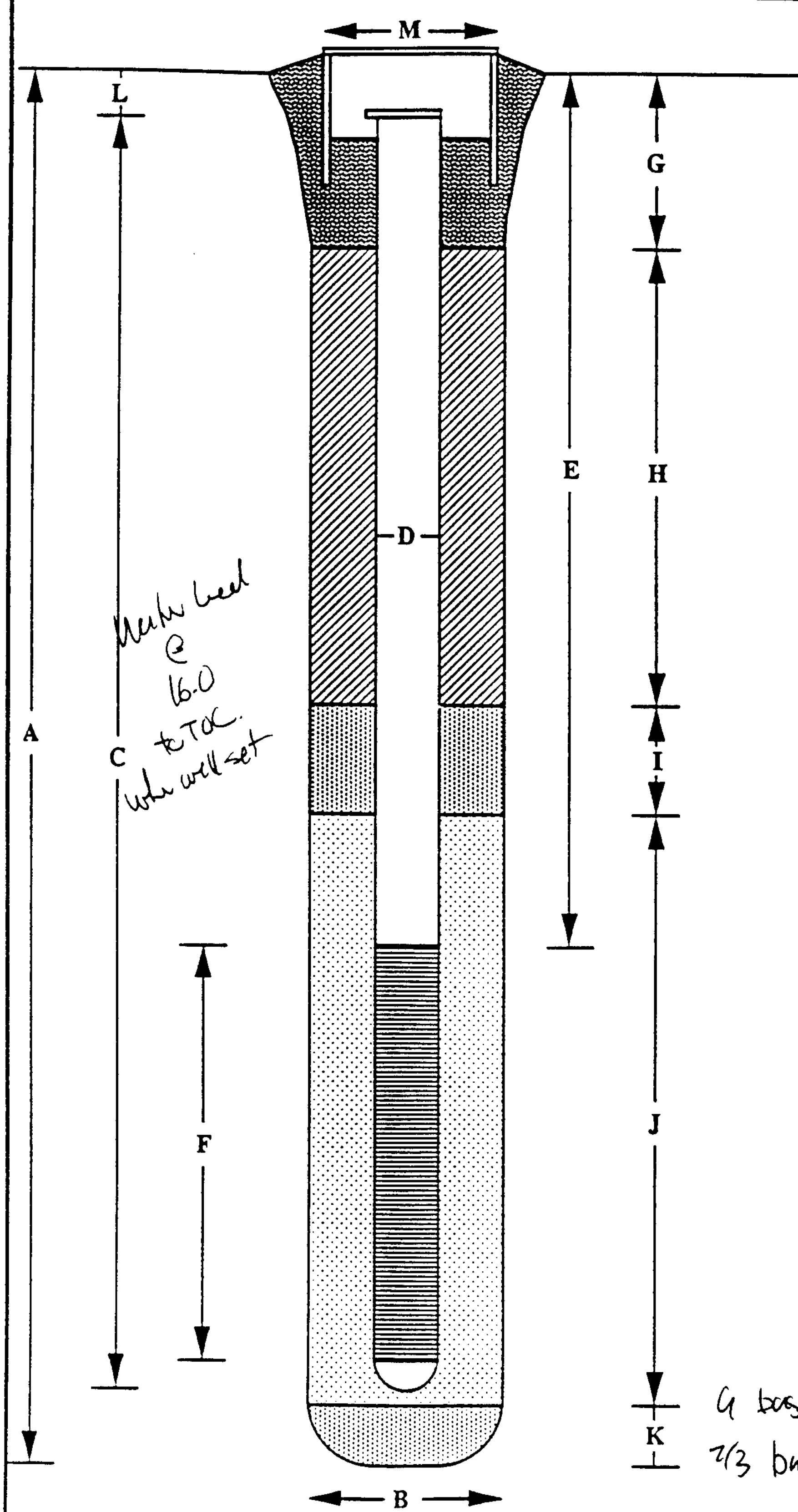
Project Number: 612-001-31-37

Location: OU-1

Datum: Ground Surface

Top of Casing Elevation:

Ground Surface Elevation:



4 bags Sand

2/3 bucket of pellets

BORING

A. Total Depth (ft): 45

B. Boring Diameter (in.): 7½

Drilling Method: HSA

WELL CONSTRUCTION

C. Casing Length (ft): ~~25~~ 45

Type: PVC

D. Casing Diameter (ft): 2-inch

E. Depth to Top of Slotted Interval (ft): 24.5

F. Perforated Casing Length (ft): 20 ft

Perforated Interval From 44.5 to 24.5 ft

Perforation Type: Slotted

Perforation Size: 0.01"

G. Surface Grout Interval (ft):

Grout Material:

H. Backfilled Interval (ft): —

Backfill Material: NA

I. Sealed Interval (ft): 22.3-19.2

Seal Material: Bentonite Pellets

J. Filter Pack Interval (ft): 45-22.3

Pack Material: 10/20 Silica Sd

K. Bottom Seal Interval (ft): —

Seal Material: NA

L. Depth to Top of Casing (in):

M. Protective Casing Diameter (in):

DRILLING LOG

1. COMPANY NAME Radian Corp.	2. DRILLING SUBCONTRACTOR Huntingdon		HOLE NO. P-3 SHEET 1 OF 1 SHEETS 3
3. PROJECT Ellsworth 2-Phase Test		4. LOCATION OU-1	
5. NAME OF DRILLER Kenneth Diers		6. MANUFACTURER'S DESIGNATION OF DRILL CME	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT 7½" OD, 3" ID HSA; 5 ft split core barrel		8. HOLE LOCATION 50 ft from MW930101	
		9. SURFACE ELEVATION	
		10. DATE STARTED 6-21-95	11. DATE COMPLETED 6-21-95
12. OVERBURDEN THICKNESS		15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE 45 ft		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
None						
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY %**
None						
22. DEPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
Completed as Piezometer		✓		[signature]		

GRAPHIC LOG a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	SAMPLE INTERVAL f	RECOVERY g	REMARKS h
	0–1	Lt. Olive Gray + Black mottled					
	1	Md Brown (5YR 4/4) clay, slightly sandy, moist, sticky			0-5 ft.	2.5 ft.	BZ = 2
	1–2	Lt. Olive Gray (5Y-5/2) to Black clayey gravel, poorly sorted with fine to medium sand, odor.	SA = 20				
	2	Sandy clay, mottled, dry.					
	3	(Probably gravel)					
	5	Olive gray to brown sandy gravel, poorly sorted, silty sub ang to subrnd pebbles, odor, loose, dry					
	5–8	Dark greenish gray (5G 4/1) to ligh olive brown (5Y 5/6) ~~tvedd~~ interbedded sand and silty sand, sand is medium to course, poorly sorted, subangular to subround, loose and unconsolidated; silty sand is well sorted fine sand with silt, loose and moist.	SA = 66		5-10 ft.	1.9 ft	BZ = 2
	10						

PROJECT 612-001-37-37 HOLE NO. P-3

DRILLING LOG

HOLE NO. P-3

PROJECT: Ellsworth 2-Phase Test | INSPECTOR: Gary Dyke | SHEET 2 OF 3 SHEETS

Graphic Log (a)	Depth (b)	Description of Materials (c)	Field Screening Results (d)	Geotech Sample or Core Box No. (e)	Sample Interval (f)	Recovery (g)	Remarks (h)
	10	As above					
	10–15	Light Olive gray (5Y 5/2) to yellow brown, gravel, very poorly sorted, silty and sandy, loose, pebbles to 3-inch diameter.	SA = 24		10-15 ft.	1.6 ft.	BZ = 2
	15	Black (AD), coars sand, moderate to well sorted, stained, wet	SA = 390		~~20-25~~ 15-20 ft	4.8 ft.	BZ = 4
	16–18	Light Olive gray (5Y 5/2), clay, weathered Pierre Shale, mottled coloring from lt. olive gray to dark olive, variably fractured					
	20–28	To 30 ft.			Cuttings only.		

15
20
25

PROJECT 612-001-31-37

HOLE NO. P-3

DRILLING LOG

HOLE NO. P-3

PROJECT Ellsworth 2-Phase Test

INSPECTOR Gary Dyke

SHEET 3 OF 3 SHEETS

GRAPHIC LOG a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	SAMPLE INTERVAL f	RECOVERY g	REMARKS h
	~~10~~ 30	As above. Light olive gray clay. Fractured from 30 to 32.5	SA= 3		30-35	5 ft.	BZ=2
	~~15~~ 35				35-40	5 ft.	
	18	Dark Olive Gray shale. Pierre shale, friable, no odor. Upper 1 ft. is wet with fractures along bedding planes.					
	~~20~~ 40				40-45	4.5 ft.	BZ=2
	~~25~~ 45	Total Depth 45.5 ft.					

Depth scale: 10 (30), 11, 12, 13, 14, 15 (35), 16, 17, 18, 19, 20 (40), 21, 22, 23, 24, 25 (45), 26, 27, 28; right scale: 30, 35, 40, 45

PROJECT

HOLE NO. P-3

SINGLE COMPLETION WELL CONSTRUCTION LOG

Well Number P-3

Project Ellsworth Z-Phase

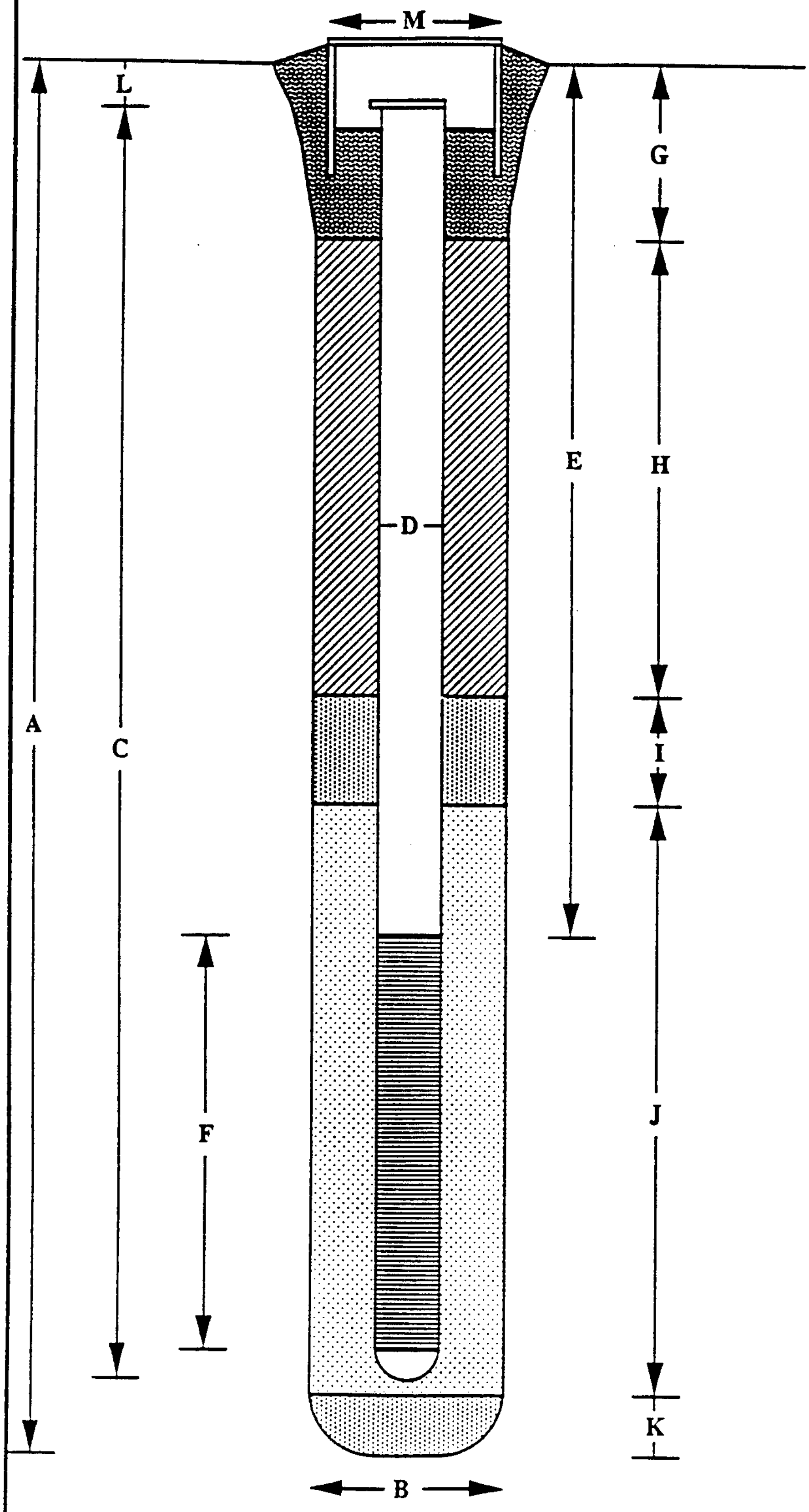
Project Number 612-001-31-37

Location OU-1

Datum

Top of Casing Elevation

Ground Surface Elevation



BORING

A. Total Depth (ft) 45 ft

B. Boring Diameter (in.) 7½

Drilling Method HSA

WELL CONSTRUCTION

C. Casing Length (ft) ~~4~~ 45.5

Type PVC

D. Casing Diameter (ft) 2 inch

E. Depth to Top of Slotted Interval (ft) 24.5

F. Perforated Casing Length (ft) 20 ft

Perforated Interval From 44.5 to 24.5 ft

Perforation Type Slotted

Perforation Size 0.01

G. Surface Grout Interval (ft)

Grout Material

H. Backfilled Interval (ft)

Backfill Material NA

I. Sealed Interval (ft) 21.9 - 19.7

Seal Material Granular Bentonite.

J. Filter Pack Interval (ft) 45.5 - 21.9

Pack Material 10/20 Silica Sd.

K. Bottom Seal Interval (ft)

Seal Material NA

L. Depth to Top of Casing (in)

M. Protective Casing Diameter (in)

10½ Sand

1 Granular Bentonite

CONTAINERIZED MATERIALS LOG

Project Ellsworth AFB 2 Phase Project - OU-1

City Ellsworth AFB State South Dakota

Drum Number	Well or Boring Number	Material Type	Date Filed First	Date Filed Last	Location Moved to	Final Disposition	Signatures of Movers
1	P-1	Soil	6/20	6/20			
2	P-1	Soil	6/20	6/20			
3	P-2	Soil	6/20	6/20			
4	P-2	Soil	6/20	6/20			
5	P-2	Soil	6/20	6/20			
6	Vapor Probes	Soil	6/21	6/21			
7	P-3	Soil	6/21	6/21			
8	P-3/Vapor Probes	Soil	6/21	6/21			
9	Vapor Probe	Soil	6/21	6/22			
10	All	Decon. Water	6/22	6/22			
11	All	Decon Water	6/22	6/22			
12	Vapor Probe	Soil	6/21	6/22			

RADIAN CORPORATION

WELL DEVELOPMENT LOG

WELL NUMBER: P-1

DATE/TIME: 6/22/95 /

PROJECT/NUMBER: 6~~62~~-001-31-37

LOCATION: OU-1 Ellsworth AFB

WEATHER: Mostly Sunny 80°F

REPORTED BY: Gary Dyke

FIELD MEASUREMENTS

DEVELOPMENT STARTED: 1310

DEPTH TO WATER BELOW TOC (ft.): 18.80

WATER COLUMN HEIGHT (ft.):

3 WELL VOLUMES (gal.):

DEVELOPMENT ENDED: 1435

WELL DEPTH BELOW TOC (ft.): 45 ft

CASING DIAMETER (ft.): 0.167

DISCHARGE VOLUME (gal.):

DEVELOPMENT METHOD/TOOLS USED: Vented surge block, bailer

Time	Cumulative Volume Purged (gal.)	pH	Conductivity (μmhos/cm)	T °C (~~°F~~)	Comments (Water clarity, etc.)
1355	1/4 gal	6.8	—	14.1	Turbid + silty
1410	4 gal	7.5	—	19.8	Turbid + silty
1425	9	7.5		12.6	less turbid
1435	13	7.6		13.6	Slightly turbid, note near btm
					W.L @ 37 ft, go work on P-2

COMMENTS Use vented surge block to surge well for 5-minutes. Then bail.

DEVELOPERS SIGNATURE(S) Gary Dyke

RADIAN CORPORATION

WELL DEVELOPMENT LOG

WELL NUMBER: P-2

DATE/TIME: 6-22-95 /

PROJECT/NUMBER: 612-001-045-31-37

LOCATION: OU-1 Ellsworth AFB

WEATHER: Overcast Rainy 70°

REPORTED BY: Gary Dyke

FIELD MEASUREMENTS

DEVELOPMENT STARTED: 1450

DEPTH TO WATER BELOW TOC (ft.): 17.69

WATER COLUMN HEIGHT (ft.):

3 WELL VOLUMES (gal.):

DEVELOPMENT ENDED: 1640

WELL DEPTH BELOW TOC (ft.): 45.0

CASING DIAMETER (ft.): (2-inch) 0.167

DISCHARGE VOLUME (gal.):

DEVELOPMENT METHOD/TOOLS USED: Surge block and bailer.

Time	Cumulative Volume Purged (gal.)	pH	Conductivity (μmhos/cm)	T (~~°F~~)°C	Comments (Water clarity, etc.)
1450	1/4	7.8	—	13.6	Turbid + silty.
1510	10	7.7		12.8	Turbid + silty
1513	13	—	—	—	Stop to allow recharge. Still very silty.
1640	18	—	—	—	Bailed dry. Very silty + turbid.

COMMENTS Surge well with vented surge block first.

DEVELOPERS SIGNATURE(S) [signature]

RADIAN CORPORATION

WELL DEVELOPMENT LOG

WELL NUMBER: P-3

DATE/TIME: 6-22-95 /

PROJECT/NUMBER: 612-001-31-37

LOCATION: OU-1 Ellsworth AFB

WEATHER: Overcast, Rain 70°

REPORTED BY: Gary Dyke

FIELD MEASUREMENTS

DEVELOPMENT STARTED: 1520

DEVELOPMENT ENDED: 1615

DEPTH TO WATER BELOW TOC (ft.): 17.82

WELL DEPTH BELOW TOC (ft.): 45.0

WATER COLUMN HEIGHT (ft.):

CASING DIAMETER (ft.): 0.167

3 WELL VOLUMES (gal.):

DISCHARGE VOLUME (gal.):

DEVELOPMENT METHOD/TOOLS USED: Surge block followed by bailer.

Time	Cumulative Volume Purged (gal.)	pH	Conductivity (µmhos/cm)	T (~~°F~~ °C)	Comments (Water clarity, etc.)
1535	1/4	7.5	—	16.4	Slightly turbid.
1555	5	6.8		14.8	Turbid + Silty
1605	10	6.9		12.6	
1615	12	6.9		12.5	Mostly clear.

COMMENTS Surged with vented surge block before developing.

DEVELOPERS SIGNATURE(S) Gary Dyke

SOIL BORING NO: SB930101

SOIL BORING LITHOLOGY DIAGRAM

Depth (ft)	Lithology	Description	Elevation (ft)
0	Fill	(CH) – DK OLIVE GREY (5Y 3/2), CLAY W/ 10–15% MED SAND AND CARBONATE NODULES, PEBBLES AND SMALL–MED COBBLES, FILL MATERIAL, SL MOIST, DIFFICULT DRILLING. 0.00 ft – 1.00 ft Depth.	3188.9
		(CH) – GREY (5Y 5/1), CLAY W/ 10–15% FMG SAND "PEPPERED" BLACK AND WHITE, PEBBLE SIZED GRAVEL, FILL MATERIAL, SL MOIST–MOIST PID = 406. 1.00 ft – 3.00 ft Depth.	
		(CH) – GREY (2.5Y 5/1), CLAY (CH) W/ 15–20% F–M SAND, 15–20% PEBBLES, FILL, SL MOIST–DRY. PID = 267. 3.00 ft – 5.00 ft Depth.	
		NO RECOVERY.	
	Sand & Gravel	(GMSM) – DK OLIVE BROWN (2.5Y 3/3), SILTY GRAVEL, PEBBLES AND COBBLES AND SILTY SAND, V FINE, W/ SILT PORE FILLING (VOID FILLING), SL MOIST–DRY. PID = 153. 8.00 ft – 10.00 ft Depth.	3180
10		NO RECOVERY.	
	Sand & Silt	(SM) – GREYISH BROWN (2.5Y 5/2) AND LT OLIVE BROWN (2.5Y5/3), SILTY SAND, MOIST–WET, FINING UPWARDS, SILTY SAND SEQUENCE INTO A SILTY GRAVEL LAST 8 FT OF INTERVAL, WATER AT TOP SPOON. PID = 368. 13.00 ft – 15.00 ft Depth.	
		NO RECOVERY.	
		(SM) – V DK GREY (5Y 3/1), SILTY SAND, F–M, W/ 25–35% PEBBLE SIZED GRAVEL, POORLY GRADED; CONTACT BETWEEN SAND–GRAVEL AND WEATHERED SHALE AT 18 FT. PID = >2500. 16.00 ft – 18.00 ft Depth.	
	F. SHALE	DK GREY (5Y 4/1) AND DK YELLOWISH BROWN (10YR 4/6), SL MOIST, WEATHERED SHALE, FRACTURED. PID = >2500. 18.00 ft – 20.00 ft Depth.	3170
20		GREY (5Y 5/1) MOTTLED, SHALE, WEATHERED, FRACTURED, LESS FRACTURED THAN ABOVE INTERVAL, ODOR PRESENT, MOIST, PID IS NOT AVAILABLE. 20.00 ft – 25.00 ft Depth.	
		V DK GREY (N3), WEATHERED SHALE, MOD FRACTURED, MOIST–WET, PID IS NOT AVAILABLE. 25.00 ft – 30.00 ft Depth.	3160
30		OLIVE GREY (5Y 4/2) MOTTLED, WEATHERED SHALE, FRACTURED, BLOCKY AT TOP OF SECTION, BOTTOM 3.5' SLIGHTLY FRACTURED, MOIST–WET. 30.00 ft –35.00 ft Depth.	
		DK OLIVE GREY (5Y 3/2), V.MOIST W/ VISIBLE WATER ON SAMPLE, SHALE, TIGHTLY LAYERED, V.FEW FRACTURES, FAIRLY COMPETENT 35.00 ft – 38.00 ft Depth.	
		V DK GREY (N3), ~~MOIST~~, UNWEATHERED SHALE, V.TIGHTLY LAYERED, NO FRACTURES, MINERALIZATION PHASES (PYRITES ETC.) 38.00 ft – 40.00 ft Depth.	3150
40		V DK GREY (N3) AND BLACK (N1), V.MOIST–WET, SHALE, LOOSELY LAYERED BUT V. COMPETENT, FRACTURED, BORING TERMINATED AT 43 FT. 40.00 ft – 43.00 ft Depth.	

Boring Completion Date 13–JUN–93

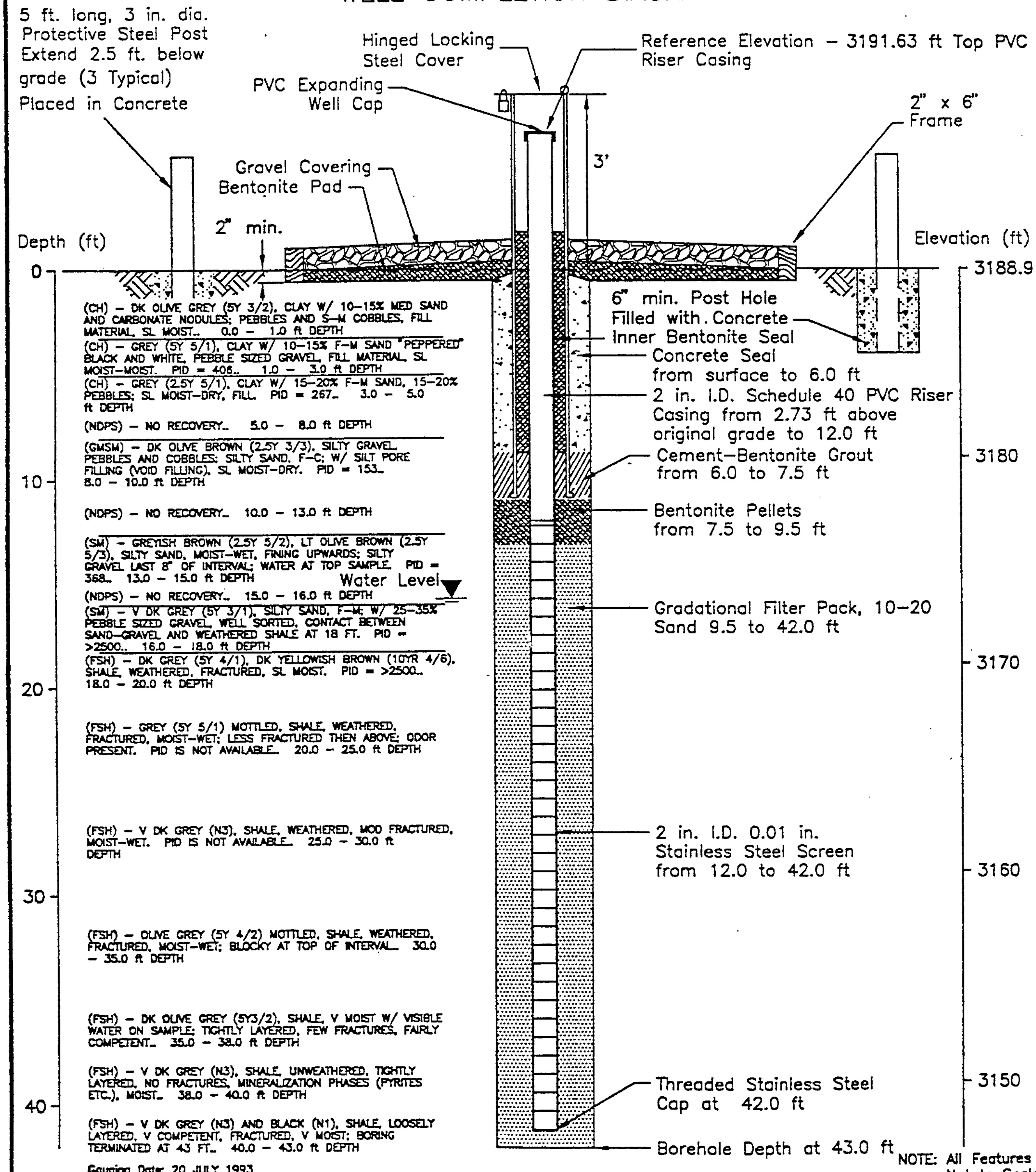
ELLSWORTH AIR FORCE BASE

Coordinates E: 1154904.8
N: 124205.4

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
RT	HLB	TRB/MG	HLB	NONE	APR/94	60378.84	

WELL NO: MW930101 (SB930101)

WELL COMPLETION DIAGRAM



NOTE: All Features Not to Scale

file: MW930101.DWG

ELLSWORTH AIR FORCE BASE

TYPICAL WELL COMPLETION DIAGRAM

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
RDT	–	HLB/MG	TMO	NONE	OCT 94	60378.84	2-2

APPENDIX C

Field Data Tables

Ellsworth Air Force Base - Two (2) Phase Pilot Test

Piezometers

Field Measurements Data Sheet

	Actual Schedule						Water Level[a] (ft)					
	Time											
Day	P1	P2	P3	P7	P15	P50	P1	P2	P3	P7	P15	P50
MW930101 Test												
25-Jun	10:30	10:30	10:30	10:30	10:30	10:30	19.18	18.60	18.40	17.56	17.96	14.52
25-Jun	12:51	12:52	12:54	12:55	12:56	12:57	20.39	19.72	18.34	17.58	17.96	14.56
25-Jun	13:32	13:34	13:36	13:37	13:39	13:40	21.82	21.22	18.32	17.58	17.98	14.56
25-Jun	15:06	15:08	15:13	15:10	15:12	15:16	23.19	23.13	18.31	17.58	17.99	14.61
25-Jun	16:56	16:58	17:04	17:01	17:06	17:02	23.61	24.17	18.29	17.60	17.99	14.63
25-Jun	21:05	21:07	21:11	21:14		21:09	24.10	24.80	18.34	17.58		14.62
26-Jun	8:44	8:45	8:48	8:47		8:50	24.74	24.89	18.54	17.58		14.62
26-Jun	13:37	13:40	13:42	13:44		13:46	24.90	24.92	18.58	17.57		14.64
26-Jun	16:10	16:11	16:13	16:16		16:15	24.95	24.88	18.60	17.56		14.62
27-Jun	8:48	8:49	8:51	8:54		8:52	25.22	24.77	18.72	17.56		14.62
27-Jun	14:52	14:54	14:57	15:00		14:58	25.26	24.73	18.76	17.56		14.62
27-Jun	20:15	20:17	20:18	20:21		20:20	25.33	24.69	18.78	17.58		14.62
28-Jun	8:43	8:45	8:47	8:51		8:49	25.34	24.60	18.90	17.60		14.62
28-Jun	12:44	12:47	12:48	12:51		12:49	25.39	24.60	18.96	17.60		14.62
28-Jun	16:26	16:28	16:29	16:32		16:31	25.42	24.58	19.01	17.58		14.61
29-Jun	8:36	8:38	8:41	8:44		8:43	25.44	24.50	19.09	17.60		14.60
29-Jun	11:40	11:41	11:42	11:45		11:44	25.44	24.48	19.07	17.59		14.59
29-Jun	14:15	14:16	14:17	14:18		14:18	25.03	24.29	19.07	17.59		14.55
ESVE Test												
29-Jun	14:54	14:55	14:57	15:00		14:58	24.80	24.14	19.12	17.60		14.55
29-Jun	16:43	16:44	16:45	16:48		16:47	24.60	23.42	19.49	17.60		14.56
30-Jun	8:42	8:43	8:44	8:46		8:45	21.28	20.02	20.58	17.60		14.53
30-Jun	11:33	11:34	11:35	11:37		11:36	21.10	19.86	20.62	17.60		14.53
30-Jun	13:56	13:57	13:58	14:00		13:59	20.98	19.75	20.67	17.60		14.53
30-Jun			14:28						20.66			

[a] The water level is measured from below the top of the casing.

Ellsworth Air Force Base - Two (2) Phase Pilot Test

Vapor Probes

Field Measurements Data Sheet

	Actual Schedule						Vapor Probe Vacuum (in. WC)								
	Time						Shallow	Deep	Shallow	Deep	Shallow	Deep	Deep	Deep	Deep
Day	VP1	VP2	VP3	VP22D	VP50D	VP60D	VP1S	VP1D	VP2S	VP2D	VP3S	VP3D	VP22D	VP50D	VP60D
MW930101 Test															
25-Jun	12:32	0:00	0:00	0:00	0:00	0:00	0.2	0.15							
25-Jun	12:37	12:35	0:00	0:00	0:00	0:00	0.2	0.25	0.1	0.1					
25-Jun	12:45	12:46	12:38	12:47	12:48	12:52	0.22	0.29	0.13	0.14	b	0.15	0.25	0.16	0.07
25-Jun	12:53	13:05	13:00	13:03	12:59	13:02	0.25	0.29	0.16	0.17	b	0.17	0.29	0.2	0.12
25-Jun	13:22	13:23	13:27	13:24	13:25	13:28	0.31	0.36	0.22	0.24	b	0.2	0.34	0.24	0.14
25-Jun	14:50	14:58	15:02	14:59	15:00	15:03	0.38	0.5	0.25	0.26	b	0.29	0.42	0.3	0.18
25-Jun	16:46	16:49	16:51	16:48	16:50	16:52	0.47	0.56	0.27	0.27	b	0.29	0.49	0.31	0.22
25-Jun	21:02	21:07	21:10	21:04	21:09	21:12	0.53	0.64	0.34	0.37	b	0.38	0.57	0.42	0.26
26-Jun	8:36	8:38	8:39	8:37	8:38	8:40	0.62	0.73	0.4	0.42	b	0.43	0.64	0.47	0.27
26-Jun	13:25	13:27	13:28	13:32	13:31	13:33	0.65	0.76	0.42	0.45	b	0.49	0.66	0.5	0.29
26-Jun	16:18	16:20	16:22	16:26	16:24	16:26	0.65	0.79	0.43	0.45	b	0.48	0.64	0.53	0.32
27-Jun	8:59	9:00	9:02	9:04	9:03	9:06	0.7	0.81	0.45	0.47	b	0.5	0.73	0.52	0.35
27-Jun	15:02	15:05	15:08	15:11	15:10	15:12	0.68	0.82	0.45	0.49	1.08	0.53	0.73	0.53	0.32
27-Jun	20:15	20:16	20:18	20:22	20:20	20:23	0.7	0.83	0.46	0.47	2	0.47	0.71	0.51	0.31
28-Jun	8:43	8:46	8:48	8:51	8:50	8:52	0.69	0.8	0.44	0.46	4.1	0.5	0.7	0.51	0.32
28-Jun	12:44	12:47	12:48	12:51	12:50	12:52	0.6	0.75	0.42	0.44	4.1	0.5	0.71	0.51	0.34
28-Jun	16:25	16:28	16:30	16:32	16:31	16:34	0.64	0.8	0.4	0.46	3.5	0.48	0.7	0.49	0.31
29-Jun	8:36	8:39	8:41	8:44	8:42	8:46	0.69	0.81	0.45	0.47	5	0.5	0.73	0.53	0.33
29-Jun	11:38	11:40	11:42	11:44	11:43	11:47	0.7	0.84	0.45	0.47	4.8	0.52	0.7	0.51	0.35
29-Jun	14:11	14:11	14:12	14:12	14:14	14:13	0	0	0	0	0	0	0	0	0
ESVE Test															
29-Jun	14:54	14:55	14:57	14:59	14:58	15:00	0	0.05	0	0	0.79	0	0	0	0
29-Jun	16:43	16:44	16:46	16:49	16:47	16:49	0	0	0	0	1.12	0	0	0	0
30-Jun	8:49	8:49	8:53	8:51	8:50	8:51	0	0	0	0	4.1	0	0	0	0
30-Jun	11:38	11:38	11:39	11:41	11:40	11:41	0	0	0	0	3.85	0	0	0	0
30-Jun	14:01	14:02	14:03	14:04	14:04	14:05	0	0	0	0	3.5	0	0	0	0
30-Jun			14:28								3.6				

[b] No reading.

Ellsworth Air Force Base - Two (2) Phase Pilot Test

2-PHASE System Operating Conditions Data Sheet

Actual Schedule		System Inlet		Wellhead		Seal Fluid		Exhaust Vapor		
Day	Time	Temp. (deg F)	Vacuum (in. Hg)	Vacuum (in. Hg)	Valve Position	Temp. (deg F)	Pressure (psi)	Temp. (deg F)	Pressure (psi)	Comments
MW930101 Test										
25-Jun	12:40	40	26.0	11.0	closed	178	1	120	2	
25-Jun	14:50	40	25.0	7.0	closed	178	1	130	2.5	
25-Jun	16:40	40	25.0	6.0	closed	178	1	133	2.6	
25-Jun	18:30	40	25.0	5.5	closed	178	1	132	2.6	
25-Jun	20:50	40	23.5	4.5	closed	176	1	132	2.7	
26-Jun	8:40	40	24.0	2.8	closed	176	1	132	3	
26-Jun	12:20	40	24.0	2.8	closed	176	1	141	2.5	
26-Jun	16:10	40	24.5	2.5	closed	176	1	145	2.7	
27-Jun	9:10	40	24.0	2.0	closed	175	1	142	2.7	
27-Jun	15:20	40	24.5	1.9	closed	172	1	150	2.8	T.O.S. 17.5"Hg
27-Jun	20:10	40	23.0	1.8	closed	174	1	138	2.8	
28-Jun	9:00	40	21.7	1.0	closed	180	1	121	2.9	T.O.S. 17.5"Hg
28-Jun	13:00	40	22.0	1.0	closed	179	1	124	2.9	
28-Jun	16:40	40	22.6	1.0	closed	177	1	125	2.8	T.O.S. 17.4"Hg
29-Jun	8:50	40	22.5	< 1.0	closed	169	1	125	2.9	T.O.S. 17.4"Hg
29-Jun	11:50	40	22.5	< 1.0	closed	172	1	128	2.9	T.O.S. 17.4"Hg
ESVE Test										
29-Jun	15:10	40	27.0	19.7	50%	177	1	112	1.7	
29-Jun	16:40	40	27.0	20.0	50%	178	1	112	1.8	T.O.S. 24"Hg
30-Jun	9:10	27	27.5	20.7	50%	178	1	115	1.9	T.O.S. 24"Hg
30-Jun	11:50	31	27.0	20.5	50%	178	1	119	1.8	T.O.S. 24.5"Hg
30-Jun	14:30	31	27.5	20.5	50%	180	1	121	1.8	T.O.S. 24.5"Hg

T.O.S. = Top Of Straw

Ellsworth Air Force Base - Two (2) Phase Pilot Test

Field Measurements Data Sheet

Actual Schedule		Cumulative	Effluent to Tank			Gas out Stack
		Time	Totalizer Readings	Actual Liquid Flow	Liquid Flow	Vapor Flow Rate
Day	Time	(hrs)	(gal)	(gal)	(gpm)	(cfm)
MW930101 Test						
25-Jun	12:40	0.00	55753.4	-	0.00	21
25-Jun	14:50	2.17	55851.9	98.5	0.75	36
25-Jun	16:40	4.00	55894.3	42.4	0.76	40
25-Jun	18:30	5.83	55923.3	29.0	0.39	41
25-Jun	20:50	8.17	55964.8	41.5	0.26	44
26-Jun	8:40	20.00	56127.7	162.9	0.30	51
26-Jun	12:20	23.67	56180.8	53.1	0.23	51
26-Jun	16:10	27.50	56231.1	50.3	0.24	55
27-Jun	9:10	44.50	56440.4	209.3	0.22	56
27-Jun	15:20	50.67	56504.7	64.3	0.21	57
27-Jun	20:10	55.50	56556.6	51.9	0.17	57
28-Jun	9:00	68.33	56691.4	134.8	0.17	55
28-Jun	13:00	72.33	56734.0	42.6	0.17	57
28-Jun	16:40	76.00	56766.4	32.4	0.15	57
29-Jun	8:50	91.17	56938.7	172.3	0.17	57
29-Jun	11:50	94.17	56954.9	16.2	0.09	57
end	12:32	94.87	56978.7	23.8	0.26	-
ESVE Test						
29-Jun	15:10	110.03	56990.2	11.5	0.08	13.5
29-Jun	16:40	111.53	57000.3	10.1	0.11	13.5
30-Jun	9:10	128.03	57091.4	91.1	0.09	13.5
30-Jun	11:50	130.70	57103.6	12.2	0.06	13.5
30-Jun	14:30	133.37	57122.0	18.4	0.07	13.5

Ellsworth Air Force Base Two (2) Phase Pilot Test Field Measurements Data Sheet			
Actual Schedule		Vapor Flow out Stack	
Day	Time	Pipe Effluent (ppm)	Breathing Zone (ppm)
MW930101 Test			
25-Jun	15:58	888	-
25-Jun	16:01	-	2
25-Jun	18:30	956	1
25-Jun	21:03	749	1
26-Jun	8:45	755	-
26-Jun	12:30	702	-
26-Jun	16:40	609	-
27-Jun	9:42	742	<1
27-Jun	15:23	682	<1
27-Jun	16:20	663	<1
28-Jun	9:00	764	<1
28-Jun	16:35	720	<1
29-Jun	8:50	763	<1
29-Jun	11:38	810	<1
29-Jun	11:47	766	<1
29-Jun	13:38 *	782	-
ESVE Test			
29-Jun	16:40	139	<1
29-Jun	14:26	342	<1
29-Jun	16:40	139	<1
30-Jun	9:40	34	<1
30-Jun	11:10	29	<1

[a] Measurements using Photo Ionizing Detector (PID)
*End of a 4 day test on MW930101.

Ellsworth Air Force Base Two (2) Phase Pilot Test Field Measurements Data Sheet		
Actual Schedule		Barometric Readings (MBars)
Day	Time	
25-Jun	12:15	908
26-Jun	16:52	905
27-Jun	8:40	904
27-Jun	15:00	906
27-Jun	20:18	906
28-Jun	8:43	908
28-Jun	16:23	910
29-Jun	8:35	913
29-Jun	15:51	913

APPENDIX D

Groundwater Sample Analytical Data

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.

P.O. BOX 2470 • RAPID CITY, SD 57709 • PHONE (605) 342-1225
610 FARNWOOD STREET • RAPID CITY, SD 57701 • FAX (605) 342-1397

AMENDED REPORT
Ellsworth AFB, SD

Radian Corporation
8501 Box 201088
Austin, TX 78720-1088

Sampled: 06-23/25-95

June 30, 1995
95-38005-007
Submitted: 06-25-95

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

Water Analysis

MW930101 | 95-38005 | 8260 LONG | RH:06-26-95

Analysis	Results	PQL[1]	Units μg/L
1,1-Dichloroethene	<10	10	
Methylene Chloride	<10	10	
trans-1,2-Dichloroethene	<10[2]	10	
1,1-Dichloroethane	<10[2]	10	
2,2-Dichloropropane	<10	10	
cis-1,2-Dichloroethene	3900[5]	10	
Bromochloromethane	<10	10	
Chloroform	<10	10	
1,1,1-Trichloroethane	<10	10	
Carbon Tetrachloride	<10	10	
1,1-Dichloropropene	<10	10	
Benzene	870[4]	10	
1,2-Dichloroethane	<10	10	
Trichloroethene	18	10	
1,2-Dichloropropane	<10	10	
Dibromomethane	<10	10	
Bromodichloromethane	<10	10	
Trans-1,3-Dichloropropene	<10	10	
Toluene	100	10	
cis-1,3-Dichloropropene	<10	10	
1,1,2-Trichloroethane	<10	10	
Tetrachloroethene	<10	10	
1,3-Dichloropropane	<10	10	
Dibromochloromethane	<10	10	
1,2-Dibromoethane	<10	10	
Chlorobenzene	<10	10	
1,1,1,2-Tetrachloroethane	<10	10	
Ethylbenzene	280[4]	10	
M+P Xylenes	840[4]	10	
O-Xylene	140	10	
Styrene	<10	10	
Bromoform	<10	10	
Isopropylbenzene	40	10	
Bromobenzene	<10	10	
1,1,2,2-Tetrachloroethane	<10	10	
1,2,3-Trichloropropane	<10	10	
n-Propylbenzene	49	10	
2-Chlorotoluene	<10	10	
4-Chlorotoluene	<10	10	
1,3,5-Trimethylbenzene	120	10	
tert-Butylbenzene	<10	10	
1,2,4-Trimethylbenzene	310[4]	10	
sec-Butylbenzene	<10[2]	10	
1,3-Dichlorobenzene	<10	10	
1,4-Dichlorobenzene	<10	10	
p-Isopropyltoluene	21	10	
1,2-Dichlorobenzene	<10	10	
n-Butylbenzene	14	10	
1,2-Dibromo-3-Chloropropane	<10	10	
1,2,4-Trichlorobenzene	<10	10	
Naphthalene	150[4]	10	
Hexachlorobutadiene	<10	10	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

MW930101 cont. 95-38005 **8260 LONG continued** RH:06-26-95

Analysis	Results	PQL	Units µg/L
1,2,3-Trichlorobenzene	<10	10	
Acetone	380	200	
Methyl Ethyl Ketone	<100	100	
Dichlorodifluoromethane	<10	10	
Chloromethane	<10	10	
Vinyl Chloride	<10	10	
Bromomethane	<10	10	
Chloroethane	<10	10	
Trichlorofluoromethane	<10	10	
2-Chloroethylvinylether	<10	10	
Carbon Disulfide	<10	10	
Vinyl Acetate	<10	10	
Methyl Isobutyl Ketone	420	100	
2-Hexanone	<100	100	
Acrolein	<100	100	
Acrylonitrile	<100	100	
Methyltertiary Butyl Ether	<10	10	
Iodomethane	<10	10	
Surrogate Recoveries			
1,2-Dichloroethane-d4	66[3]		% Recovery
Toluene-d8	93		
4-Bromofluorobenzene	106		

[1] Sample diluted 10x at analysis due to the high level of cis-1,2-dichloroethene present.
[2] Present but less than the PQL.
[3] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d_4.
[4] Value derived from a 100x dilution.
[5] Value derived from a 1000x dilution.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Effluent-1		95-38006	**8260 LONG**				RH:06-25-95
						PQL	Units µg/L
				1,1-Dichloroethene	<1.0	1.0	
				Methylene Chloride	<1.0	1.0	
				trans-1,2-Dichloroethene	<1.0	1.0	
				1,1-Dichloroethane	<1.0	1.0	
				2,2-Dichloropropane	<1.0	1.0	
				cis-1,2-Dichloroethene	<1.0	1.0	
				Bromochloromethane	<1.0	1.0	
				Chloroform	<1.0	1.0	
				1,1,1-Trichloroethane	<1.0	1.0	
				Carbon Tetrachloride	<1.0	1.0	
				1,1-Dichloropropene	<1.0	1.0	
				Benzene	<1.0	1.0	
				1,2-Dichloroethane	<1.0	1.0	
				Trichloroethene	<1.0	1.0	
				1,2-Dichloropropane	<1.0	1.0	
				Dibromomethane	<1.0	1.0	
				Bromodichloromethane	<1.0	1.0	
				Trans-1,3-Dichloropropene	<1.0	1.0	
				Toluene	<1.0	1.0	
				cis-1,3-Dichloropropene	<1.0	1.0	
				1,1,2-Trichloroethane	<1.0	1.0	
				Tetrachloroethene	<1.0	1.0	
				1,3-Dichloropropane	<1.0	1.0	
				Dibromochloromethane	<1.0	1.0	
				1,2-Dibromoethane	<1.0	1.0	
				Chlorobenzene	<1.0	1.0	
				1,1,1,2-Tetrachloroethane	<1.0	1.0	
				Ethylbenzene	<1.0	1.0	
				M+P Xylenes	<1.0	1.0	
				O-Xylene	<1.0	1.0	
				Styrene	<1.0	1.0	
				Bromoform	<1.0	1.0	
				Isopropylbenzene	<1.0	1.0	
				Bromobenzene	<1.0	1.0	
				1,1,2,2-Tetrachloroethane	<1.0	1.0	
				1,2,3-Trichloropropane	<1.0	1.0	
				n-Propylbenzene	<1.0	1.0	
				2-Chlorotoluene	<1.0	1.0	
				4-Chlorotoluene	<1.0	1.0	
				1,3,5-Trimethylbenzene	<1.0	1.0	
				tert-Butylbenzene	<1.0	1.0	
				1,2,4-Trimethylbenzene	<1.0	1.0	
				sec-Butylbenzene	<1.0	1.0	
				1,3-Dichlorobenzene	<1.0	1.0	
				1,4-Dichlorobenzene	<1.0	1.0	
				p-Isopropyltoluene	<1.0	1.0	
				1,2-Dichlorobenzene	<1.0	1.0	
				n-Butylbenzene	<1.0	1.0	
				1,2-Dibromo-3-Chloropropane	<1.0	1.0	
				1,2,4-Trichlorobenzene	<1.0	1.0	
				Naphthalene	<1.0	1.0	
				Hexachlorobutadiene	<1.0	1.0	
				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone	54	20	
				Methyl Ethyl Ketone	<10	10	
				Dichlorodifluoromethane	<1.0	1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether	<1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone	<10	10	
				Acrolein	<10	10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether	<1.0	1.0	
				Iodomethane	<1.0	1.0	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	100		% Recovery
				Toluene-d8	100		
				4-Bromofluorobenzene	99		

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Effluent 1 cont.		95-38006	EPA Method 8270	Acenaphthene	<10	μg/L	B 06-29-95
				Acenaphthylene	<10		
				Anthracene	<10		
				Azobenzene	<10		
				Benzidine	<20		
				Benzo(a)Anthracene	<10		
				Benzo(b)fluoranthene	<10		
				Benzo(k)fluoranthene	<10		
				Benzo(g,h,i)perylene	<10		
				Benzo(a)pyrene	<10		
				4-Bromophenyl-phenylether	<10		
				Butylbenzylphthalate	<10		
				4-Chloro-3-Methylphenol	<10		
				bis(-2-Chloroethoxy)Methane	<10		
				bis(-2-Chloroethyl)Ether	<10		
				bis(2-Chloroisopropyl)ether	<10		
				2-Chloronaphthalene	<10		
				2-Chlorophenol	<10		
				4-Chlorophenol	<10		
				4-Chlorophenyl-phenylether-	<10		
				Chrysene	<10		
				Dibenzo(a,h)anthracene	<10		
				1,2-Dichlorobenzene	<10		
				1,3-Dichlorobenzene	<10		
				1,4-Dichlorobenzene	<10		
				3,3-Dichlorobenzidine	<20		
				2,4-Dichlorophenol	<10		
				Diethylphthalate	<10		
				Dimethyl Phthalate	<10		
				2,4-Dimethylphenol	<10		
				Di-n-Butylphthalate	<10		
				4,6-Dinitro-2-methylphenol	<50		
				2,4-Dinitrophenol	<50		
				2,4-Dinitrotoluene	<10		
				2,6-Dinitrotoluene	<10		
				Di-n-octyl Phthalate	<10		
				bis(2-ethylhexyl)Phthalate	2.3JB		
				Fluoranthene	<10		
				Fluorene	<10		
				Hexachlorobenzene	<10		
				Hexachlorobutadiene	<10		
				Hexachlorocyclopentadiene	<10		
				Hexachloroethane	<10		
				Indeno(1,2,3-c,d)pyrene	<10		
				Isophorone	<10		
				1-Methylnaphthalene	<10		
				2-Methylnaphthalene	<10		
				2-Methylphenol	<10		
				4-Methylphenol/3-Methylphenol	<10		
				Naphthalene	<10		
				Nitrobenzene	<10		
				2-Nitrophenol	<10		
				4-Nitrophenol	<50		
				N-Nitrosodimethylamine	<10		
				N-nitroso-Di-n-propylamine	<10		
				N-nitrosodiphenylamine	<10		
				Pentachlorophenol	<50		
				Phenanthrene	<10		
				Phenol	<10		
				Pyrene	<10		
				Pyridine	<20		
				1,2,4-Trichlorobenzene	<10		
				2,4,5-Trichlorophenol	<10		
				2,4,6-Trichlorophenol	<10		
			Surrogate Recovery				QC Limits
				2-fluorophenol	30	% Recovery	21-100
				Phenol-d5	30		10-94
				Nitrobenzene-d5	43		35-114
				2-Fluorobiphenyl	43		43-116
				2,4,6-Tribromophenol	35		10-123
				Terphenyl-d14	72		33-141

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-1		95-38007	**8260 LONG**				RH:06-26-95
						PQL[1]	Units µg/L
				1,1-Dichloroethene	<10	10	
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	**700[3]**	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	**220[3]**	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	**16**	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	**28**	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	**65**	10	
				M+P Xylenes	**180**	10	
				O-Xylene	**13**	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	**11**	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	**12**	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	**24**	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	**130**	10	
				sec-Butylbenzene	<10	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	<10	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	<10	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	**30**	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	<200	200	
				Methyl Ethyl Ketone	<100	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-1 cont.		95-38007	**8260 LONG** Surrogate Recoveries				RH:06-26-95
				1,2-Dichloroethane-d4	71[2]	% Recovery	
				Toluene-d8	92		
				4-Bromofluorobenzene	96		

[1] Sample diluted 10x at analysis due to non-target compound sample matrix interference.
[2] The high level of benzene present caused a suppression of the 1,2-Dichloroethane-d_4
[3] Value derived from a 100x dilution.

Kurt R. Slentz ____________________
Laboratory Manager

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Method Blank 8260 LONG RH:06-25-95

Units µg/L

Analysis	Result	PQL
1,1-Dichloroethene	< 1.0	1.0
Methylene Chloride	< 1.0	1.0
trans-1,2-Dichloroethene	< 1.0	1.0
1,1-Dichloroethane	< 1.0	1.0
2,2-Dichloropropane	< 1.0	1.0
cis-1,2-Dichloroethene	< 1.0	1.0
Bromochloromethane	< 1.0	1.0
Chloroform	< 1.0	1.0
1,1,1-Trichloroethane	< 1.0	1.0
Carbon Tetrachloride	< 1.0	1.0
1,1-Dichloropropene	< 1.0	1.0
Benzene	< 1.0	1.0
1,2-Dichloroethane	< 1.0	1.0
Trichloroethene	< 1.0	1.0
1,2-Dichloropropane	< 1.0	1.0
Dibromomethane	< 1.0	1.0
Bromodichloromethane	< 1.0	1.0
Trans-1,3-Dichloropropene	< 1.0	1.0
Toluene	< 1.0	1.0
cis-1,3-Dichloropropene	< 1.0	1.0
1,1,2-Trichloroethane	< 1.0	1.0
Tetrachloroethene	< 1.0	1.0
1,3-Dichloropropane	< 1.0	1.0
Dibromochloromethane	< 1.0	1.0
1,2-Dibromoethane	< 1.0	1.0
Chlorobenzene	< 1.0	1.0
1,1,1,2-Tetrachloroethane	< 1.0	1.0
Ethylbenzene	< 1.0	1.0
M + P Xylenes	< 1.0	1.0
O-Xylene	< 1.0	1.0
Styrene	< 1.0	1.0
Bromoform	< 1.0	1.0
Isopropylbenzene	< 1.0	1.0
Bromobenzene	< 1.0	1.0
1,1,2,2-Tetrachloroethane	< 1.0	1.0
1,2,3-Trichloropropane	< 1.0	1.0
n-Propylbenzene	< 1.0	1.0
2-Chlorotoluene	< 1.0	1.0
4-Chlorotoluene	< 1.0	1.0
1,3,5-Trimethylbenzene	< 1.0	1.0
tert-Butylbenzene	< 1.0	1.0
1,2,4-Trimethylbenzene	< 1.0	1.0
sec-Butylbenzene	< 1.0	1.0
1,3-Dichlorobenzene	< 1.0	1.0
1,4-Dichlorobenzene	< 1.0	1.0
p-Isopropyltoluene	< 1.0	1.0
1,2-Dichlorobenzene	< 1.0	1.0
n-Butylbenzene	< 1.0	1.0
1,2-Dibromo-3-Chloropropane	< 1.0	1.0
1,2,4-Trichlorobenzene	< 1.0	1.0
Naphthalene	< 1.0	1.0
Hexachlorobutadiene	< 1.0	1.0
1,2,3-Trichlorobenzene	< 1.0	1.0
Acetone	< 20	20
Methyl Ethyl Ketone	< 10	10
Dichlorodifluoromethane	< 1.0	1.0
Chloromethane	< 1.0	1.0
Vinyl Chloride	< 1.0	1.0
Bromomethane	< 1.0	1.0
Chloroethane	< 1.0	1.0
Trichlorofluoromethane	< 1.0	1.0
2-Chloroethylvinylether	< 1.0	1.0
Carbon Disulfide	< 1.0	1.0
Vinyl Acetate	< 1.0	1.0
Methyl Isobutyl Ketone	< 10	10
2-Hexanone	< 10	10
Acrolein	< 10	10
Acrylonitrile	< 10	10
Methyltertiary Butyl Ether	< 1.0	1.0
Iodomethane	< 1.0	1.0

Surrogate Recoveries

Surrogate	Result	Units
1,2-Dichloroethane-d4	100	% Recovery
Toluene-d8	100	
4-Bromofluorobenzene	100	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Method Blank 8260 LONG RH:06-26-95

Units µg/L

Analysis	Results	PQL
1,1-Dichloroethene	< 1.0	1.0
Methylene Chloride	< 1.0	1.0
trans-1,2-Dichloroethene	< 1.0	1.0
1,1-Dichloroethane	< 1.0	1.0
2,2-Dichloropropane	< 1.0	1.0
cis-1,2-Dichloroethene	< 1.0	1.0
Bromochloromethane	< 1.0	1.0
Chloroform	< 1.0	1.0
1,1,1-Trichloroethane	< 1.0	1.0
Carbon Tetrachloride	< 1.0	1.0
1,1-Dichloropropene	< 1.0	1.0
Benzene	< 1.0	1.0
1,2-Dichloroethane	< 1.0	1.0
Trichloroethene	< 1.0	1.0
1,2-Dichloropropane	< 1.0	1.0
Dibromomethane	< 1.0	1.0
Bromodichloromethane	< 1.0	1.0
Trans-1,3-Dichloropropene-	< 1.0	1.0
Toluene	< 1.0	1.0
cis-1,3-Dichloropropene	< 1.0	1.0
1,1,2-Trichloroethane	< 1.0	1.0
Tetrachloroethene	< 1.0	1.0
1,3-Dichloropropane	< 1.0	1.0
Dibromochloromethane	< 1.0	1.0
1,2-Dibromoethane	< 1.0	1.0
Chlorobenzene	< 1.0	1.0
1,1,1,2-Tetrachloroethane	< 1.0	1.0
Ethylbenzene	< 1.0	1.0
M + P Xylenes	< 1.0	1.0
O-Xylene	< 1.0	1.0
Styrene	< 1.0	1.0
Bromoform	< 1.0	1.0
Isopropylbenzene	< 1.0	1.0
Bromobenzene	< 1.0	1.0
1,1,2,2-Tetrachloroethane	< 1.0	1.0
1,2,3-Trichloropropane	< 1.0	1.0
n-Propylbenzene	< 1.0	1.0
2-Chlorotoluene	< 1.0	1.0
4-Chlorotoluene	< 1.0	1.0
1,3,5-Trimethylbenzene	< 1.0	1.0
tert-Butylbenzene	< 1.0	1.0
1,2,4-Trimethylbenzene	< 1.0	1.0
sec-Butylbenzene	< 1.0	1.0
1,3-Dichlorobenzene	< 1.0	1.0
1,4-Dichlorobenzene	< 1.0	1.0
p-Isopropyltoluene	< 1.0	1.0
1,2-Dichlorobenzene	< 1.0	1.0
n-Butylbenzene	< 1.0	1.0
1,2-Dibromo-3-Chloropropane	< 1.0	1.0
1,2,4-Trichlorobenzene	< 1.0	1.0
Naphthalene	< 1.0	1.0
Hexachlorobutadiene	< 1.0	1.0
1,2,3-Trichlorobenzene	< 1.0	1.0
Acetone	< 20	20
Methyl Ethyl Ketone	< 10	10
Dichlorodifluoromethane	< 1.0	1.0
Chloromethane	< 1.0	1.0
Vinyl Chloride	< 1.0	1.0
Bromomethane	< 1.0	1.0
Chloroethane	< 1.0	1.0
Trichlorofluoromethane	< 1.0	1.0
2-Chloroethylvinylether	< 1.0	1.0
Carbon Disulfide	< 1.0	1.0
Vinyl Acetate	< 1.0	1.0
Methyl Isobutyl Ketone	< 10	10
2-Hexanone	< 10	10
Acrolein	< 10	10
Acrylonitrile	< 10	10
Methyltertiary Butyl Ether	< 1.0	1.0
Iodomethane	< 1.0	1.0

Surrogate Recoveries

Surrogate	Result	Units
1,2-Dichloroethane-d4	103	% Recovery
Toluene-d8	99	
4-Bromofluorobenzene	102	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Trip Blank 8260 LONG RH:06-25-95

Units µg/L

Analysis	Results	PQL
1,1-Dichloroethene	<1.0	1.0
Methylene Chloride	<1.0	1.0
trans-1,2-Dichloroethene	<1.0	1.0
1,1-Dichloroethane	<1.0	1.0
2,2-Dichloropropane	<1.0	1.0
cis-1,2-Dichloroethene	<1.0	1.0
Bromochloromethane	<1.0	1.0
Chloroform	<1.0	1.0
1,1,1-Trichloroethane	<1.0	1.0
Carbon Tetrachloride	<1.0	1.0
1,1-Dichloropropene	<1.0	1.0
Benzene	<1.0	1.0
1,2-Dichloroethane	<1.0	1.0
Trichloroethene	<1.0	1.0
1,2-Dichloropropane	<1.0	1.0
Dibromomethane	<1.0	1.0
Bromodichloromethane	<1.0	1.0
Trans-1,3-Dichloropropene	<1.0	1.0
Toluene	<1.0	1.0
cis-1,3-Dichloropropene	<1.0	1.0
1,1,2-Trichloroethane	<1.0	1.0
Tetrachloroethene	<1.0	1.0
1,3-Dichloropropane	<1.0	1.0
Dibromochloromethane	<1.0	1.0
1,2-Dibromoethane	<1.0	1.0
Chlorobenzene	<1.0	1.0
1,1,1,2-Tetrachloroethane	<1.0	1.0
Ethylbenzene	<1.0	1.0
M + P Xylenes	<1.0	1.0
O-Xylene	<1.0	1.0
Styrene	<1.0	1.0
Bromoform	<1.0	1.0
Isopropylbenzene	<1.0	1.0
Bromobenzene	<1.0	1.0
1,1,2,2-Tetrachloroethane	<1.0	1.0
1,2,3-Trichloropropane	<1.0	1.0
n-Propylbenzene	<1.0	1.0
2-Chlorotoluene	<1.0	1.0
4-Chlorotoluene	<1.0	1.0
1,3,5-Trimethylbenzene	<1.0	1.0
tert-Butylbenzene	<1.0	1.0
1,2,4-Trimethylbenzene	<1.0	1.0
sec-Butylbenzene	<1.0	1.0
1,3-Dichlorobenzene	<1.0	1.0
1,4-Dichlorobenzene	<1.0	1.0
p-Isopropyltoluene	<1.0	1.0
1,2-Dichlorobenzene	<1.0	1.0
n-Butylbenzene	<1.0	1.0
1,2-Dibromo-3-Chloropropane	<1.0	1.0
1,2,4-Trichlorobenzene	<1.0	1.0
Naphthalene	<1.0	1.0
Hexachlorobutadiene	<1.0	1.0
1,2,3-Trichlorobenzene	<1.0	1.0
Acetone	98	20
Methyl Ethyl Ketone	<10	10
Dichlorodifluoromethane	<1.0	1.0
Chloromethane	<1.0	1.0
Vinyl Chloride	<1.0	1.0
Bromomethane	<1.0	1.0
Chloroethane	<1.0	1.0
Trichlorofluoromethane	<1.0	1.0
2-Chloroethylvinylether	<1.0	1.0
Carbon Disulfide	<1.0	1.0
Vinyl Acetate	<1.0	1.0
Methyl Isobutyl Ketone	<10	10
2-Hexanone	<10	10
Acrolein	<10	10
Acrylonitrile	<10	10
Methyltertiary Butyl Ether	<1.0	1.0
Iodomethane	<1.0	1.0

Surrogate Recoveries

Surrogate	Result	Units
1,2-Dichloroethane-d4	95	% Recovery
Toluene-d8	100	
4-Bromofluorobenzene	102	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Laboratory Reagent Report — EPA Method 8270 — B 06-28-95

Analysis	Results	Units
Acenaphthene	<10	µg/L
Acenaphthylene	<10	
Anthracene	<10	
Azobenzene	<10	
Benzidine	<20	
Benzo(a)Anthracene	<10	
Benzo(b)fluoranthene	<10	
Benzo(k)fluoranthene	<10	
Benzo(g,h,i)perylene	<10	
Benzo(a)pyrene	<10	
4-Bromophenyl-phenylether	<10	
Butylbenzylphthalate	<10	
4-Chloro-3-Methylphenol	<10	
bis(-2-Chloroethoxy)Methane	<10	
bis(-2-Chloroethyl)Ether	<10	
bis(2-Chloroisopropyl)ether	<10	
2-Chloronaphthalene	<10	
2-Chlorophenol	<10	
4-Chlorophenol	<10	
4-Chlorophenyl-phenylether	<10	
Chrysene	<10	
Dibenzo(a,h)anthracene	<10	
1,2-Dichlorobenzene	<10	
1,3-Dichlorobenzene	<10	
1,4-Dichlorobenzene	<10	
3,3-Dichlorobenzidine	<20	
2,4-Dichlorophenol	<10	
Diethylphthalate	2.9J	
Dimethyl Phthalate	<10	
2,4-Dimethylphenol	<10	
Di-n-Butylphthalate	<10	
4,6-Dinitro-2-methylphenol	<50	
2,4-Dinitrophenol	<50	
2,4-Dinitrotoluene	<10	
2,6-Dinitrotoluene	<10	
Di-n-octyl Phthalate	<10	
bis(2-ethylhexyl)Phthalate	1.7J	
Fluoranthene	<10	
Fluorene	<10	
Hexachlorobenzene	<10	
Hexachlorobutadiene	<10	
Hexachlorocyclopentadiene	<10	
Hexachloroethane	<10	
Indeno(1,2,3-c,d)pyrene	<10	
Isophorone	<10	
1-Methylnaphthalene	<10	
2-Methylnaphthalene	<10	
2-Methylphenol	<10	
4-Methylphenol/3-Methylphenol	<10	
Naphthalene	<10	
Nitrobenzene	<10	
2-Nitrophenol	<10	
4-Nitrophenol	<50	
N-Nitrosodimethylamine	<10	
N-nitroso-Di-n-propylamine	<10	
N-nitrosodiphenylamine	<10	
Pentachlorophenol	<50	
Phenanthrene	<10	
Phenol	<10	
Pyrene	<10	
Pyridine	<20	
1,2,4-Trichlorobenzene	<10	
2,4,5-Trichlorophenol	<10	
2,4,6-Trichlorophenol	<10	

Surrogate Recovery

Analysis	Results	Units	QC Limits
2-fluorophenol	45	% Recovery	21-100
Phenol-d5	41		10-94
Nitrobenzene-d5	60		35-114
2-Fluorobiphenyl	57		43-116
2,4,6-Tribromophenol	61		10-123
Terphenyl-d14	74		33-141

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Site	Methodology	Analysis	Results	Units	QC Limits	Analyzed
Blank Spike	EPA Method 8270					[B] 06-28-95
		Acenaphthene	40*	% Recovery	46-118	
		4-Chloro-3-Methylphenol	52		23-97	
		2-Chlorophenol	42		27-123	
		1,4-Dichlorobenzene	30*		36-97	
		2,4-Dinitrotoluene	48		24-96	
		4-Nitrophenol	59		10-80	
		N-nitroso-Di-n-propylamine	41		41-116	
		Pentachlorophenol	45		9-103	
		Phenol	40		12-110	
		Pyrene	45		26-127	
		1,2,4-Trichlorobenzene	31*		39-98	
	Surrogate Recovery				QC Limits	
		2-fluorophenol	39	% Recovery	21-100	
		Phenol-d5	39		10-94	
		Nitrobenzene-d5	53		35-114	
		2-Fluorobiphenyl	52		43-116	
		2,4,6-Tribromophenol	66		10-123	
		Terphenyl-d14	74		33-141	

* Value outside QC limits.
[B] Analysis performed at Energy Laboratories, Billings, Montana.

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 2470 • RAPID CITY, SD 57709 • PHONE (605) 342-1225
610 FARNWOOD STREET • RAPID CITY, SD 57701 • FAX (605) 342-1397

James Machin Radian Corporation 3201 C. Street, Suite 405 Anchorage, AK 99503	EAFB Project #612-001-31-37 Sampled: 06-25/26/27-95	July 17, 1995 95-38061-67 Submitted: 06-27-95

Site	Depth	Lab No.	Methodology	Analysis	Results	PQL	Units	Analyzed
Water Analysis								
Influent-2		95-38061	8260 LONG					RH:06-30-95
				1,1-Dichloroethene	<10	10	µg/L	
				Methylene Chloride	<10	10		
				trans-1,2-Dichloroethene	<10	10		
				1,1-Dichloroethane	<10	10		
				2,2-Dichloropropane	<10	10		
				cis-1,2-Dichloroethene	790 [3]	10		
				Bromochloromethane	<10	10		
				Chloroform	<10	10		
				1,1,1-Trichloroethane	<10	10		
				Carbon Tetrachloride	<10	10		
				1,1-Dichloropropene	<10	10		
				Benzene	270 [3]	10		
				1,2-Dichloroethane	<10	10		
				Trichloroethene	19	10		
				1,2-Dichloropropane	<10	10		
				Dibromomethane	<10	10		
				Bromodichloromethane	<10	10		
				Trans-1,3-Dichloropropene	<10	10		
				Toluene	53	10		
				cis-1,3-Dichloropropene	<10	10		
				1,1,2-Trichloroethane	<10	10		
				Tetrachloroethene	<10	10		
				1,3-Dichloropropane	<10	10		
				Dibromochloromethane	<10	10		
				1,2-Dibromoethane	<10	10		
				Chlorobenzene	<10	10		
				1,1,1,2-Tetrachloroethane	<10	10		
				Ethylbenzene	110	10		
				M+P Xylenes	260	10		
				O-Xylene	18	10		
				Styrene	<10	10		
				Bromoform	<10	10		
				Isopropylbenzene	15	10		
				Bromobenzene	<10	10		
				1,1,2,2-Tetrachloroethane	<10	10		
				1,2,3-Trichloropropane	<10	10		
				n-Propylbenzene	17	10		
				2-Chlorotoluene	<10	10		
				4-Chlorotoluene	<10	10		
				1,3,5-Trimethylbenzene	31	10		
				tert-Butylbenzene	<10	10		
				1,2,4-Trimethylbenzene	160	10		
				sec-Butylbenzene	<10	10		
				1,3-Dichlorobenzene	<10	10		
				1,4-Dichlorobenzene	<10	10		
				p-Isopropyltoluene	<10 [4]	10		
				1,2-Dichlorobenzene	<10	10		
				n-Butylbenzene	<10	10		
				1,2-Dibromo-3-Chloropropane	<10	10		
				1,2,4-Trichlorobenzene	<10	10		
				Naphthalene	39	10		
				Hexachlorobutadiene	<10	10		

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-2 cont.		95-38061	**8260 LONG**			PQL [1]	**RH:06-30-95**
				1,2,3-Trichlorobenzene	<10	10	µg/L
				Acetone	**240**	200	
				Methyl Ethyl Ketone	<100[4]	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	63[2]	% Recovery	
				Toluene-d8	95		
				4-Bromofluorobenzene	98		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethene-d4
[3] Value derived from a 100X dilution.
[4] Present but less than the PQL.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-3		95-38062	8260 LONG			PQL [1]	RH:07-05-95
				1,1-Dichloroethene	<10	10	µg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	1000 [3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	360 [3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	26	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	95	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	130	10	
				M + P Xylenes	320 [3]	10	
				O-Xylene	42	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	21	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	28	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	86	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	180 [3]	10	
				sec-Butylbenzene	<10 [4]	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	18	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	16	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	62	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	330	200	
				Methyl Ethyl Ketone	120	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	69 [2]	% Recovery	
				Toluene-d8	108		
				4-Bromofluorobenzene	99		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.
[4] Present but less than the PQL.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-4		95-38063	**8260 LONG**			PQL [1]	RH:07-05-95
				1,1-Dichloroethene	<10	10	µg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	910 [3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	330 [3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	31	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	130	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	150	10	
				M + P Xylenes	390 [3]	10	
				O-Xylene	50	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	23	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	31	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	84	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	220 [3]	10	
				sec-Butylbenzene	<10 [4]	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	17	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	15	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	52	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	400	200	
				Methyl Ethyl Ketone	130	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	62 [2]	% Recovery	
				Toluene-d8	102		
				4-Bromofluorobenzene	110		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.
[4] Present but less than the PQL.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-5		95-38064	8260 LONG			PQL [1]	RH:07-05-95
				1,1-Dichloroethene	<10	10	µg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	790 [3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	270 [3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	29	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	130	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	130	10	
				M+P Xylenes	380	10	
				O-Xylene	40	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	14	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	<10	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	48	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	30 [3]	10	
				sec-Butylbenzene	<10	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	14	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	10	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	64	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	380	200	
				Methyl Ethyl Ketone	130	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	72 [2]	% Recovery	
				Toluene-d8	105		
				4-Bromofluorobenzene	101		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-6		95-38065	8260 LONG			PQL [1]	RH:07-05-95
				1,1-Dichloroethene	<10	10	µg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	810 [3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	260 [3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	28	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	140	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	130	10	
				M + P Xylenes	400	10	
				O-Xylene	44	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	18	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	17	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	42	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	15 [3]	10	
				sec-Butylbenzene	<10	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	11	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	<10 [4]	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	57	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	490	200	
				Methyl Ethyl Ketone	160	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	72 [2]	% Recovery	
				Toluene-d8	98		
				4-Bromofluorobenzene	106		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.
[4] Present but less than the PQL.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-6D		95-38066	**8260 LONG**			PQL [1]	RH:07-07-95
				1,1-Dichloroethene	<10	10	µg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	760 [3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	260 [3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	27	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	130	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	120	10	
				M + P Xylenes	350	10	
				O-Xylene	42	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	16	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	16	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	41	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	200	10	
				sec-Butylbenzene	<10	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	11	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	<10 [4]	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	55	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	450	200	
				Methyl Ethyl Ketone	150	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	73 [2]	% Recovery	
				Toluene-d8	105		
				4-Bromofluorobenzene	104		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.
[4] Present but less than the PQL.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-7		95-38067	8260 LONG			PQL [1]	RH:07-06-95
				1,1-Dichloroethene	<10	10	µg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	810 [3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	290 [3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	32	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	180	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	130	10	
				M + P Xylenes	440 [3]	10	
				O-Xylene	82	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	15	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	21	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	54	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	240 [3]	10	
				sec-Butylbenzene	<10	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	14	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	12	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	86	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	740	200	
				Methyl Ethyl Ketone	230	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	68 [2]	% Recovery	
				Toluene-d8	99		
				4-Bromofluorobenzene	94		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.
[4] Present but less than the PQL.

Kurt R. Slentz

Laboratory Manager

QUALITY ASSURANCE DATA

Site	Methodology	Analysis	Results	PQL	Units	Analyzed
Trip Blank	8260 LONG					RH:06-30-95
		1,1-Dichloroethene	<1.0	1.0	µg/L	
		Methylene Chloride	<1.0	1.0		
		trans-1,2-Dichloroethene	<1.0	1.0		
		1,1-Dichloroethane	<1.0	1.0		
		2,2-Dichloropropane	<1.0	1.0		
		cis-1,2-Dichloroethene	<1.0	1.0		
		Bromochloromethane	<1.0	1.0		
		Chloroform	<1.0	1.0		
		1,1,1-Trichloroethane	<1.0	1.0		
		Carbon Tetrachloride	<1.0	1.0		
		1,1-Dichloropropene	<1.0	1.0		
		Benzene	<1.0	1.0		
		1,2-Dichloroethane	<1.0	1.0		
		Trichloroethene	<1.0	1.0		
		1,2-Dichloropropane	<1.0	1.0		
		Dibromomethane	<1.0	1.0		
		Bromodichloromethane	<1.0	1.0		
		Trans-1,3-Dichloropropene	<1.0	1.0		
		Toluene	<1.0	1.0		
		cis-1,3-Dichloropropene	<1.0	1.0		
		1,1,2-Trichloroethane	<1.0	1.0		
		Tetrachloroethene	<1.0	1.0		
		1,3-Dichloropropane	<1.0	1.0		
		Dibromochloromethane	<1.0	1.0		
		1,2-Dibromoethane	<1.0	1.0		
		Chlorobenzene	<1.0	1.0		
		1,1,1,2-Tetrachloroethane	<1.0	1.0		
		Ethylbenzene	<1.0	1.0		
		M+P Xylenes	<1.0	1.0		
		O-Xylene	<1.0	1.0		
		Styrene	<1.0	1.0		
		Bromoform	<1.0	1.0		
		Isopropylbenzene	<1.0	1.0		
		Bromobenzene	<1.0	1.0		
		1,1,2,2-Tetrachloroethane	<1.0	1.0		
		1,2,3-Trichloropropane	<1.0	1.0		
		n-Propylbenzene	<1.0	1.0		
		2-Chlorotoluene	<1.0	1.0		
		4-Chlorotoluene	<1.0	1.0		
		1,3,5-Trimethylbenzene	<1.0	1.0		
		tert-Butylbenzene	<1.0	1.0		
		1,2,4-Trimethylbenzene	<1.0	1.0		
		sec-Butylbenzene	<1.0	1.0		
		1,3-Dichlorobenzene	<1.0	1.0		
		1,4-Dichlorobenzene	<1.0	1.0		
		p-Isopropyltoluene	<1.0	1.0		
		1,2-Dichlorobenzene	<1.0	1.0		
		n-Butylbenzene	<1.0	1.0		
		1,2-Dibromo-3-Chloropropane	<1.0	1.0		
		1,2,4-Trichlorobenzene	<1.0	1.0		
		Naphthalene	<1.0	1.0		
		Hexachlorobutadiene	<1.0	1.0		
		1,2,3-Trichlorobenzene	<1.0	1.0		
		Acetone	53	20		
		Methyl Ethyl Ketone	<10	10		
		Dichlorodifluoromethane	<1.0	1.0		
		Chloromethane	<1.0	1.0		
		Vinyl Chloride	<1.0	1.0		
		Bromomethane	<1.0	1.0		
		Chloroethane	<1.0	1.0		
		Trichlorofluoromethane	<1.0	1.0		
		2-Chloroethylvinylether	<1.0	1.0		
		Carbon Disulfide	<1.0	1.0		
		Vinyl Acetate	<1.0	1.0		
		Methyl Isobutyl Ketone	<10	10		
		2-Hexanone	<10	10		
		Acrolein	<10	10		
		Acrylonitrile	<10	10		
		Methyltertiary Butyl Ether	<1.0	1.0		
		Iodomethane	<1.0	1.0		
	Surrogate Recoveries					
		1,2-Dichloroethane-d4	90	% Recovery		
		Toluene-d8	103			
		4-Bromofluorobenzene	104			

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Sample	Methodology	Analysis	Results	PQL	Units / Analyzed
Method Blank	8260 LONG			PQL	RH:06-30-95
		1,1-Dichloroethene	<1.0	1.0	µg/L
		Methylene Chloride	<1.0	1.0	
		trans-1,2-Dichloroethene	<1.0	1.0	
		1,1-Dichloroethane	<1.0	1.0	
		2,2-Dichloropropane	<1.0	1.0	
		cis-1,2-Dichloroethene	<1.0	1.0	
		Bromochloromethane	<1.0	1.0	
		Chloroform	<1.0	1.0	
		1,1,1-Trichloroethane	<1.0	1.0	
		Carbon Tetrachloride	<1.0	1.0	
		1,1-Dichloropropene	<1.0	1.0	
		Benzene	<1.0	1.0	
		1,2-Dichloroethane	<1.0	1.0	
		Trichloroethene	<1.0	1.0	
		1,2-Dichloropropane	<1.0	1.0	
		Dibromomethane	<1.0	1.0	
		Bromodichloromethane	<1.0	1.0	
		Trans-1,3-Dichloropropene	<1.0	1.0	
		Toluene	<1.0	1.0	
		cis-1,3-Dichloropropene	<1.0	1.0	
		1,1,2-Trichloroethane	<1.0	1.0	
		Tetrachloroethene	<1.0	1.0	
		1,3-Dichloropropane	<1.0	1.0	
		Dibromochloromethane	<1.0	1.0	
		1,2-Dibromoethane	<1.0	1.0	
		Chlorobenzene	<1.0	1.0	
		1,1,1,2-Tetrachloroethane	<1.0	1.0	
		Ethylbenzene	<1.0	1.0	
		M+P Xylenes	<1.0	1.0	
		O-Xylene	<1.0	1.0	
		Styrene	<1.0	1.0	
		Bromoform	<1.0	1.0	
		Isopropylbenzene	<1.0	1.0	
		Bromobenzene	<1.0	1.0	
		1,1,2,2-Tetrachloroethane	<1.0	1.0	
		1,2,3-Trichloropropane	<1.0	1.0	
		n-Propylbenzene	<1.0	1.0	
		2-Chlorotoluene	<1.0	1.0	
		4-Chlorotoluene	<1.0	1.0	
		1,3,5-Trimethylbenzene	<1.0	1.0	
		tert-Butylbenzene	<1.0	1.0	
		1,2,4-Trimethylbenzene	<1.0	1.0	
		sec-Butylbenzene	<1.0	1.0	
		1,3-Dichlorobenzene	<1.0	1.0	
		1,4-Dichlorobenzene	<1.0	1.0	
		p-Isopropyltoluene	<1.0	1.0	
		1,2-Dichlorobenzene	<1.0	1.0	
		n-Butylbenzene	<1.0	1.0	
		1,2-Dibromo-3-Chloropropane	<1.0	1.0	
		1,2,4-Trichlorobenzene	<1.0	1.0	
		Naphthalene	<1.0	1.0	
		Hexachlorobutadiene	<1.0	1.0	
		1,2,3-Trichlorobenzene	<1.0	1.0	
		Acetone	<20	20	
		Methyl Ethyl Ketone	<10	10	
		Dichlorodifluoromethane	<1.0	1.0	
		Chloromethane	<1.0	1.0	
		Vinyl Chloride	<1.0	1.0	
		Bromomethane	<1.0	1.0	
		Chloroethane	<1.0	1.0	
		Trichlorofluoromethane	<1.0	1.0	
		2-Chloroethylvinylether	<1.0	1.0	
		Carbon Disulfide	<1.0	1.0	
		Vinyl Acetate	<1.0	1.0	
		Methyl Isobutyl Ketone	<10	10	
		2-Hexanone	<10	10	
		Acrolein	<10	10	
		Acrylonitrile	<10	10	
		Methyltertiary Butyl Ether	<1.0	1.0	
		Iodomethane	<1.0	1.0	
	Surrogate Recoveries				
		1,2-Dichloroethane-d4	100	% Recovery	
		Toluene-d8	106		
		4-Bromofluorobenzene	98		

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Method Blank 8260 LONG			PQL	RH:07-05-95
1,1-Dichloroethene	<1.0		1.0	µg/L
Methylene Chloride	<1.0		1.0	
trans-1,2-Dichloroethene	<1.0		1.0	
1,1-Dichloroethane	<1.0		1.0	
2,2-Dichloropropane	<1.0		1.0	
cis-1,2-Dichloroethene	<1.0		1.0	
Bromochloromethane	<1.0		1.0	
Chloroform	<1.0		1.0	
1,1,1-Trichloroethane	<1.0		1.0	
Carbon Tetrachloride	<1.0		1.0	
1,1-Dichloropropene	<1.0		1.0	
Benzene	<1.0		1.0	
1,2-Dichloroethane	<1.0		1.0	
Trichloroethene	<1.0		1.0	
1,2-Dichloropropane	<1.0		1.0	
Dibromomethane	<1.0		1.0	
Bromodichloromethane	<1.0		1.0	
Trans-1,3-Dichloropropene	<1.0		1.0	
Toluene	<1.0		1.0	
cis-1,3-Dichloropropene	<1.0		1.0	
1,1,2-Trichloroethane	<1.0		1.0	
Tetrachloroethene	<1.0		1.0	
1,3-Dichloropropane	<1.0		1.0	
Dibromochloromethane	<1.0		1.0	
1,2-Dibromoethane	<1.0		1.0	
Chlorobenzene	<1.0		1.0	
1,1,1,2-Tetrachloroethane	<1.0		1.0	
Ethylbenzene	<1.0		1.0	
M+P Xylenes	<1.0		1.0	
O-Xylene	<1.0		1.0	
Styrene	<1.0		1.0	
Bromoform	<1.0		1.0	
Isopropylbenzene	<1.0		1.0	
Bromobenzene	<1.0		1.0	
1,1,2,2-Tetrachloroethane	<1.0		1.0	
1,2,3-Trichloropropane	<1.0		1.0	
n-Propylbenzene	<1.0		1.0	
2-Chlorotoluene	<1.0		1.0	
4-Chlorotoluene	<1.0		1.0	
1,3,5-Trimethylbenzene	<1.0		1.0	
tert-Butylbenzene	<1.0		1.0	
1,2,4-Trimethylbenzene	<1.0		1.0	
sec-Butylbenzene	<1.0		1.0	
1,3-Dichlorobenzene	<1.0		1.0	
1,4-Dichlorobenzene	<1.0		1.0	
p-Isopropyltoluene	<1.0		1.0	
1,2-Dichlorobenzene	<1.0		1.0	
n-Butylbenzene	<1.0		1.0	
1,2-Dibromo-3-Chloropropane	<1.0		1.0	
1,2,4-Trichlorobenzene	<1.0		1.0	
Naphthalene	<1.0		1.0	
Hexachlorobutadiene	<1.0		1.0	
1,2,3-Trichlorobenzene	<1.0		1.0	
Acetone	<20		20	
Methyl Ethyl Ketone	<10		10	
Dichlorodifluoromethane	<1.0		1.0	
Chloromethane	<1.0		1.0	
Vinyl Chloride	<1.0		1.0	
Bromomethane	<1.0		1.0	
Chloroethane	<1.0		1.0	
Trichlorofluoromethane	<1.0		1.0	
2-Chloroethylvinylether	<1.0		1.0	
Carbon Disulfide	<1.0		1.0	
Vinyl Acetate	<1.0		1.0	
Methyl Isobutyl Ketone	<10		10	
2-Hexanone	<10		10	
Acrolein	<10		10	
Acrylonitrile	<10		10	
Methyltertiary Butyl Ether	<1.0		1.0	
Iodomethane	<1.0		1.0	
Surrogate Recoveries				
1,2-Dichloroethane-d4	89	% Recovery		
Toluene-d8	98			
4-Bromofluorobenzene	100			

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Method Blank 8260 LONG

Analysis	Results	PQL	Units / Analyzed
1,1-Dichloroethene	<1.0	1.0	RH:07-06-95 µg/L
Methylene Chloride	<1.0	1.0	
trans-1,2-Dichloroethene	<1.0	1.0	
1,1-Dichloroethane	<1.0	1.0	
2,2-Dichloropropane	<1.0	1.0	
cis-1,2-Dichloroethene	<1.0	1.0	
Bromochloromethane	<1.0	1.0	
Chloroform	<1.0	1.0	
1,1,1-Trichloroethane	<1.0	1.0	
Carbon Tetrachloride	<1.0	1.0	
1,1-Dichloropropene	<1.0	1.0	
Benzene	<1.0	1.0	
1,2-Dichloroethane	<1.0	1.0	
Trichloroethene	<1.0	1.0	
1,2-Dichloropropane	<1.0	1.0	
Dibromomethane	<1.0	1.0	
Bromodichloromethane	<1.0	1.0	
Trans-1,3-Dichloropropene	<1.0	1.0	
Toluene	<1.0	1.0	
cis-1,3-Dichloropropene	<1.0	1.0	
1,1,2-Trichloroethane	<1.0	1.0	
Tetrachloroethene	<1.0	1.0	
1,3-Dichloropropane	<1.0	1.0	
Dibromochloromethane	<1.0	1.0	
1,2-Dibromoethane	<1.0	1.0	
Chlorobenzene	<1.0	1.0	
1,1,1,2-Tetrachloroethane	<1.0	1.0	
Ethylbenzene	<1.0	1.0	
M+P Xylenes	<1.0	1.0	
O-Xylene	<1.0	1.0	
Styrene	<1.0	1.0	
Bromoform	<1.0	1.0	
Isopropylbenzene	<1.0	1.0	
Bromobenzene	<1.0	1.0	
1,1,2,2-Tetrachloroethane	<1.0	1.0	
1,2,3-Trichloropropane	<1.0	1.0	
n-Propylbenzene	<1.0	1.0	
2-Chlorotoluene	<1.0	1.0	
4-Chlorotoluene	<1.0	1.0	
1,3,5-Trimethylbenzene	<1.0	1.0	
tert-Butylbenzene	<1.0	1.0	
1,2,4-Trimethylbenzene	<1.0	1.0	
sec-Butylbenzene	<1.0	1.0	
1,3-Dichlorobenzene	<1.0	1.0	
1,4-Dichlorobenzene	<1.0	1.0	
p-Isopropyltoluene	<1.0	1.0	
1,2-Dichlorobenzene	<1.0	1.0	
n-Butylbenzene	<1.0	1.0	
1,2-Dibromo-3-Chloropropane	<1.0	1.0	
1,2,4-Trichlorobenzene	<1.0	1.0	
Naphthalene	<1.0	1.0	
Hexachlorobutadiene	<1.0	1.0	
1,2,3-Trichlorobenzene	<1.0	1.0	
Acetone	<20	20	
Methyl Ethyl Ketone	<10	10	
Dichlorodifluoromethane	<1.0	1.0	
Chloromethane	<1.0	1.0	
Vinyl Chloride	<1.0	1.0	
Bromomethane	<1.0	1.0	
Chloroethane	<1.0	1.0	
Trichlorofluoromethane	<1.0	1.0	
2-Chloroethylvinylether	<1.0	1.0	
Carbon Disulfide	<1.0	1.0	
Vinyl Acetate	<1.0	1.0	
Methyl Isobutyl Ketone	<10	10	
2-Hexanone	<10	10	
Acrolein	<10	10	
Acrylonitrile	<10	10	
Methyltertiary Butyl Ether	<1.0	1.0	
Iodomethane	<1.0	1.0	

Surrogate Recoveries

Surrogate	Result	Units
1,2-Dichloroethane-d4	98	% Recovery
Toluene-d8	99	
4-Bromofluorobenzene	100	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

ENERGY LABORATORIES, INC.
RAPID CITY, SD

VOLATILE ORGANIC COMPOUNDS
QUALITY ASSURANCE REPORT FORM

SAMPLE LOT 95-38061
SAMPLE MATRIX Water
EXTRACTION DATE -
ANALYST R.H.

MATRIX SPIKE / MATRIX SPIKE DUPLICATE DATA

Compound	Spike Added (μg)/L	Sample (μg)	Matrix Spike (μg)	Matrix Spike % Rec	Matrix Spike Duplicate (μg)	Matrix Spike Duplicate % Rec	% Difference $\left(\frac{\text{Difference}}{\text{Average}}\right)$	QC Limits
1,1-Dichloroethene	1000	<100	1160	116	1130	113	2.6	60-140%
Benzene	1000	270	1430	116	1400	113	2.6	60-140%
Trichloroethene	1000	<100	1260	126	1170	117	7.4	60-140%
Toluene	1000	<100	1230	123	1240	124	0.81	60-140%
Chlorobenzene	1000	<100	1220	122	1220	122	0	60-140%

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 2470 • RAPID CITY, SD 57709 • PHONE (605) 342-1225
610 FARNWOOD STREET • RAPID CITY, SD 57701 • FAX (605) 342-1397

James Machin Radian Corporation 3201 C. Street, Suite 405 Anchorage, AK 99503	EAFB Project #612-001-31-37 Sampled: 06-27/28/29-95	July 18, 1995 95-38191-95 Submitted: 06-29-95

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

Water Analysis

Influent-8 95-38191 8260 LONG RH:07-07-95

Analysis	Results	PQL [1]	Units
1,1-Dichloroethene	<10	10	µg/L
Methylene Chloride	<10	10	
trans-1,2-Dichloroethene	<10	10	
1,1-Dichloroethane	<10	10	
2,2-Dichloropropane	<10	10	
cis-1,2-Dichloroethene	700 [3]	10	
Bromochloromethane	<10	10	
Chloroform	<10	10	
1,1,1-Trichloroethane	<10	10	
Carbon Tetrachloride	<10	10	
1,1-Dichloropropene	<10	10	
Benzene	240 [3]	10	
1,2-Dichloroethane	<10	10	
Trichloroethene	33	10	
1,2-Dichloropropane	<10	10	
Dibromomethane	<10	10	
Bromodichloromethane	<10	10	
Trans-1,3-Dichloropropene	<10	10	
Toluene	200	10	
cis-1,3-Dichloropropene	<10	10	
1,1,2-Trichloroethane	<10	10	
Tetrachloroethene	<10	10	
1,3-Dichloropropane	<10	10	
Dibromochloromethane	<10	10	
1,2-Dibromoethane	<10	10	
Chlorobenzene	<10	10	
1,1,1,2-Tetrachloroethane	<10	10	
Ethylbenzene	130	10	
M+P Xylenes	430 [3]	10	
O-Xylene	80	10	
Styrene	<10	10	
Bromoform	<10	10	
Isopropylbenzene	15	10	
Bromobenzene	<10	10	
1,1,2,2-Tetrachloroethane	<10	10	
1,2,3-Trichloropropane	<10	10	
n-Propylbenzene	21	10	
2-Chlorotoluene	<10	10	
4-Chlorotoluene	<10	10	
1,3,5-Trimethylbenzene	54	10	
tert-Butylbenzene	<10	10	
1,2,4-Trimethylbenzene	320 [3]	10	
sec-Butylbenzene	<10	10	
1,3-Dichlorobenzene	<10	10	
1,4-Dichlorobenzene	<10	10	
p-Isopropyltoluene	16	10	
1,2-Dichlorobenzene	<10	10	
n-Butylbenzene	13	10	
1,2-Dibromo-3-Chloropropane	<10	10	
1,2,4-Trichlorobenzene	<10	10	
Naphthalene	97	10	
Hexachlorobutadiene	<10	10	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-8 cont.		95-38191	8260 LONG				RH:07-07-95
						PQL [1]	
				1,2,3-Trichlorobenzene	<10	10	μg/L
				Acetone	730	200	
				Methyl Ethyl Ketone	220	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	67 [2]	% Recovery	
				Toluene-d8	101		
				4-Bromofluorobenzene	99		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethene-d4
[3] Value derived from a 100X dilution.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-9		95-38192	**8260 LONG**			PQL [1]	RH:07-07-95
				1,1-Dichloroethene	<10	10	µg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	860 [3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	320 [3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	44	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	230 [3]	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	160	10	
				M + P Xylenes	900 [3]	10	
				O-Xylene	110	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	20	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	28	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	90	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	1100 [3]	10	
				sec-Butylbenzene	<10	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	19	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	16	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	130	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	1200	200	
				Methyl Ethyl Ketone	360	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	72 [2]	% Recovery	
				Toluene-d8	96		
				4-Bromofluorobenzene	99		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-11		95-38194	8260 LONG			PQL[1]	RH:07-07-95
				1,1-Dichloroethene	<10	10	μg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	630[3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	230[3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	39	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	180[3]	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	<10	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	130	10	
				M + P Xylenes	420[3]	10	
				O-Xylene	120	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	17	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	23	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	82	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	240[3]	10	
				sec-Butylbenzene	<10	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	18	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	16	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	110	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	1300	200	
				Methyl Ethyl Ketone	350	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	68[2]	% Recovery	
				Toluene-d8	96		
				4-Bromofluorobenzene	97		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
MW930101-Post Test		95-38195	**8260 LONG**			PQL [1]	RH:07-05-95
				1,1-Dichloroethene	<10	10	µg/L
				Methylene Chloride	<10	10	
				trans-1,2-Dichloroethene	<10	10	
				1,1-Dichloroethane	<10	10	
				2,2-Dichloropropane	<10	10	
				cis-1,2-Dichloroethene	1900 [3]	10	
				Bromochloromethane	<10	10	
				Chloroform	<10	10	
				1,1,1-Trichloroethane	<10	10	
				Carbon Tetrachloride	<10	10	
				1,1-Dichloropropene	<10	10	
				Benzene	470 [3]	10	
				1,2-Dichloroethane	<10	10	
				Trichloroethene	120	10	
				1,2-Dichloropropane	<10	10	
				Dibromomethane	<10	10	
				Bromodichloromethane	<10	10	
				Trans-1,3-Dichloropropene	<10	10	
				Toluene	220	10	
				cis-1,3-Dichloropropene	<10	10	
				1,1,2-Trichloroethane	<10	10	
				Tetrachloroethene	20	10	
				1,3-Dichloropropane	<10	10	
				Dibromochloromethane	<10	10	
				1,2-Dibromoethane	<10	10	
				Chlorobenzene	<10	10	
				1,1,1,2-Tetrachloroethane	<10	10	
				Ethylbenzene	56	10	
				M + P Xylenes	1000 [3]	10	
				O-Xylene	160 [3]	10	
				Styrene	<10	10	
				Bromoform	<10	10	
				Isopropylbenzene	14	10	
				Bromobenzene	<10	10	
				1,1,2,2-Tetrachloroethane	<10	10	
				1,2,3-Trichloropropane	<10	10	
				n-Propylbenzene	<10	10	
				2-Chlorotoluene	<10	10	
				4-Chlorotoluene	<10	10	
				1,3,5-Trimethylbenzene	210	10	
				tert-Butylbenzene	<10	10	
				1,2,4-Trimethylbenzene	480 [3]	10	
				sec-Butylbenzene	<10	10	
				1,3-Dichlorobenzene	<10	10	
				1,4-Dichlorobenzene	<10	10	
				p-Isopropyltoluene	37	10	
				1,2-Dichlorobenzene	<10	10	
				n-Butylbenzene	17	10	
				1,2-Dibromo-3-Chloropropane	<10	10	
				1,2,4-Trichlorobenzene	<10	10	
				Naphthalene	140	10	
				Hexachlorobutadiene	<10	10	
				1,2,3-Trichlorobenzene	<10	10	
				Acetone	1300	200	
				Methyl Ethyl Ketone	350	100	
				Dichlorodifluoromethane	<10	10	
				Chloromethane	<10	10	
				Vinyl Chloride	<10	10	
				Bromomethane	<10	10	
				Chloroethane	<10	10	
				Trichlorofluoromethane	<10	10	
				2-Chloroethylvinylether	<10	10	
				Carbon Disulfide	<10	10	
				Vinyl Acetate	<10	10	
				Methyl Isobutyl Ketone	<100	100	
				2-Hexanone	<100	100	
				Acrolein	<100	100	
				Acrylonitrile	<100	100	
				Methyltertiary Butyl Ether	<10	10	
				Iodomethane	<10	10	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	61 [2]	% Recovery	
				Toluene-d8	103		
				4-Bromofluorobenzene	111		

[1] Sample diluted 10X at analysis due to the high level of target compounds present.
[2] The high level of benzene present caused a suppression of the 1,2-dichloroethane-d4.
[3] Value derived from a 100X dilution.

Kurt R. Slentz *Kurt R. Slentz*
Laboratory Manager

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Trip Blank — 8260 LONG — RH:07-07-95 — µg/L

Analysis	Results	PQL
1,1-Dichloroethene	<1.0	1.0
Methylene Chloride	<1.0	1.0
trans-1,2-Dichloroethene	<1.0	1.0
1,1-Dichloroethane	<1.0	1.0
2,2-Dichloropropane	<1.0	1.0
cis-1,2-Dichloroethene	<1.0	1.0
Bromochloromethane	<1.0	1.0
Chloroform	<1.0	1.0
1,1,1-Trichloroethane	<1.0	1.0
Carbon Tetrachloride	<1.0	1.0
1,1-Dichloropropene	<1.0	1.0
Benzene	<1.0	1.0
1,2-Dichloroethane	<1.0	1.0
Trichloroethene	<1.0	1.0
1,2-Dichloropropane	<1.0	1.0
Dibromomethane	<1.0	1.0
Bromodichloromethane	<1.0	1.0
Trans-1,3-Dichloropropene	<1.0	1.0
Toluene	<1.0	1.0
cis-1,3-Dichloropropene	<1.0	1.0
1,1,2-Trichloroethane	<1.0	1.0
Tetrachloroethene	<1.0	1.0
1,3-Dichloropropane	<1.0	1.0
Dibromochloromethane	<1.0	1.0
1,2-Dibromoethane	<1.0	1.0
Chlorobenzene	<1.0	1.0
1,1,1,2-Tetrachloroethane	<1.0	1.0
Ethylbenzene	<1.0	1.0
M+P Xylenes	<1.0	1.0
O-Xylene	<1.0	1.0
Styrene	<1.0	1.0
Bromoform	<1.0	1.0
Isopropylbenzene	<1.0	1.0
Bromobenzene	<1.0	1.0
1,1,2,2-Tetrachloroethane	<1.0	1.0
1,2,3-Trichloropropane	<1.0	1.0
n-Propylbenzene	<1.0	1.0
2-Chlorotoluene	<1.0	1.0
4-Chlorotoluene	<1.0	1.0
1,3,5-Trimethylbenzene	<1.0	1.0
tert-Butylbenzene	<1.0	1.0
1,2,4-Trimethylbenzene	<1.0	1.0
sec-Butylbenzene	<1.0	1.0
1,3-Dichlorobenzene	<1.0	1.0
1,4-Dichlorobenzene	<1.0	1.0
p-Isopropyltoluene	<1.0	1.0
1,2-Dichlorobenzene	<1.0	1.0
n-Butylbenzene	<1.0	1.0
1,2-Dibromo-3-Chloropropane	<1.0	1.0
1,2,4-Trichlorobenzene	<1.0	1.0
Naphthalene	<1.0	1.0
Hexachlorobutadiene	<1.0	1.0
1,2,3-Trichlorobenzene	<1.0	1.0
Acetone	<20	20
Methyl Ethyl Ketone	<10	10
Dichlorodifluoromethane	<1.0	1.0
Chloromethane	<1.0	1.0
Vinyl Chloride	<1.0	1.0
Bromomethane	<1.0	1.0
Chloroethane	<1.0	1.0
Trichlorofluoromethane	<1.0	1.0
2-Chloroethylvinylether	<1.0	1.0
Carbon Disulfide	<1.0	1.0
Vinyl Acetate	<1.0	1.0
Methyl Isobutyl Ketone	<10	10
2-Hexanone	<10	10
Acrolein	<10	10
Acrylonitrile	<10	10
Methyltertiary Butyl Ether	<1.0	1.0
Iodomethane	<1.0	1.0

Surrogate Recoveries

Surrogate	Results	Units
1,2-Dichloroethane-d4	104	% Recovery
Toluene-d8	94	
4-Bromofluorobenzene	93	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Method Blank **8260 LONG** RH:07-07-95

Analysis	Results	PQL	Units
1,1-Dichloroethene	<1.0	1.0	µg/L
Methylene Chloride	<1.0	1.0	
trans-1,2-Dichloroethene	<1.0	1.0	
1,1-Dichloroethane	<1.0	1.0	
2,2-Dichloropropane	<1.0	1.0	
cis-1,2-Dichloroethene	<1.0	1.0	
Bromochloromethane	<1.0	1.0	
Chloroform	<1.0	1.0	
1,1,1-Trichloroethane	<1.0	1.0	
Carbon Tetrachloride	<1.0	1.0	
1,1-Dichloropropene	<1.0	1.0	
Benzene	<1.0	1.0	
1,2-Dichloroethane	<1.0	1.0	
Trichloroethene	<1.0	1.0	
1,2-Dichloropropane	<1.0	1.0	
Dibromomethane	<1.0	1.0	
Bromodichloromethane	<1.0	1.0	
Trans-1,3-Dichloropropene	<1.0	1.0	
Toluene	<1.0	1.0	
cis-1,3-Dichloropropene	<1.0	1.0	
1,1,2-Trichloroethane	<1.0	1.0	
Tetrachloroethene	<1.0	1.0	
1,3-Dichloropropane	<1.0	1.0	
Dibromochloromethane	<1.0	1.0	
1,2-Dibromoethane	<1.0	1.0	
Chlorobenzene	<1.0	1.0	
1,1,1,2-Tetrachloroethane	<1.0	1.0	
Ethylbenzene	<1.0	1.0	
M+P Xylenes	<1.0	1.0	
O-Xylene	<1.0	1.0	
Styrene	<1.0	1.0	
Bromoform	<1.0	1.0	
Isopropylbenzene	<1.0	1.0	
Bromobenzene	<1.0	1.0	
1,1,2,2-Tetrachloroethane	<1.0	1.0	
1,2,3-Trichloropropane	<1.0	1.0	
n-Propylbenzene	<1.0	1.0	
2-Chlorotoluene	<1.0	1.0	
4-Chlorotoluene	<1.0	1.0	
1,3,5-Trimethylbenzene	<1.0	1.0	
tert-Butylbenzene	<1.0	1.0	
1,2,4-Trimethylbenzene	<1.0	1.0	
sec-Butylbenzene	<1.0	1.0	
1,3-Dichlorobenzene	<1.0	1.0	
1,4-Dichlorobenzene	<1.0	1.0	
p-Isopropyltoluene	<1.0	1.0	
1,2-Dichlorobenzene	<1.0	1.0	
n-Butylbenzene	<1.0	1.0	
1,2-Dibromo-3-Chloropropane	<1.0	1.0	
1,2,4-Trichlorobenzene	<1.0	1.0	
Naphthalene	<1.0	1.0	
Hexachlorobutadiene	<1.0	1.0	
1,2,3-Trichlorobenzene	<1.0	1.0	
Acetone	<20	20	
Methyl Ethyl Ketone	<10	10	
Dichlorodifluoromethane	<1.0	1.0	
Chloromethane	<1.0	1.0	
Vinyl Chloride	<1.0	1.0	
Bromomethane	<1.0	1.0	
Chloroethane	<1.0	1.0	
Trichlorofluoromethane	<1.0	1.0	
2-Chloroethylvinylether	<1.0	1.0	
Carbon Disulfide	<1.0	1.0	
Vinyl Acetate	<1.0	1.0	
Methyl Isobutyl Ketone	<10	10	
2-Hexanone	<10	10	
Acrolein	<10	10	
Acrylonitrile	<10	10	
Methyltertiary Butyl Ether	<1.0	1.0	
Iodomethane	<1.0	1.0	

Surrogate Recoveries

Surrogate	Result	Units
1,2-Dichloroethane-d4	96	% Recovery
Toluene-d8	106	
4-Bromofluorobenzene	102	

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Method Blank	8260 LONG			PQL		RH:07-10-95
		1,1-Dichloroethene	<1.0	1.0	µg/L	
		Methylene Chloride	<1.0	1.0		
		trans-1,2-Dichloroethene	<1.0	1.0		
		1,1-Dichloroethane	<1.0	1.0		
		2,2-Dichloropropane	<1.0	1.0		
		cis-1,2-Dichloroethene	<1.0	1.0		
		Bromochloromethane	<1.0	1.0		
		Chloroform	<1.0	1.0		
		1,1,1-Trichloroethane	<1.0	1.0		
		Carbon Tetrachloride	<1.0	1.0		
		1,1-Dichloropropene	<1.0	1.0		
		Benzene	<1.0	1.0		
		1,2-Dichloroethane	<1.0	1.0		
		Trichloroethene	<1.0	1.0		
		1,2-Dichloropropane	<1.0	1.0		
		Dibromomethane	<1.0	1.0		
		Bromodichloromethane	<1.0	1.0		
		Trans-1,3-Dichloropropene	<1.0	1.0		
		Toluene	<1.0	1.0		
		cis-1,3-Dichloropropene	<1.0	1.0		
		1,1,2-Trichloroethane	<1.0	1.0		
		Tetrachloroethene	<1.0	1.0		
		1,3-Dichloropropane	<1.0	1.0		
		Dibromochloromethane	<1.0	1.0		
		1,2-Dibromoethane	<1.0	1.0		
		Chlorobenzene	<1.0	1.0		
		1,1,1,2-Tetrachloroethane	<1.0	1.0		
		Ethylbenzene	<1.0	1.0		
		M+P Xylenes	<1.0	1.0		
		O-Xylene	<1.0	1.0		
		Styrene	<1.0	1.0		
		Bromoform	<1.0	1.0		
		Isopropylbenzene	<1.0	1.0		
		Bromobenzene	<1.0	1.0		
		1,1,2,2-Tetrachloroethane	<1.0	1.0		
		1,2,3-Trichloropropane	<1.0	1.0		
		n-Propylbenzene	<1.0	1.0		
		2-Chlorotoluene	<1.0	1.0		
		4-Chlorotoluene	<1.0	1.0		
		1,3,5-Trimethylbenzene	<1.0	1.0		
		tert-Butylbenzene	<1.0	1.0		
		1,2,4-Trimethylbenzene	<1.0	1.0		
		sec-Butylbenzene	<1.0	1.0		
		1,3-Dichlorobenzene	<1.0	1.0		
		1,4-Dichlorobenzene	<1.0	1.0		
		p-Isopropyltoluene	<1.0	1.0		
		1,2-Dichlorobenzene	<1.0	1.0		
		n-Butylbenzene	<1.0	1.0		
		1,2-Dibromo-3-Chloropropane	<1.0	1.0		
		1,2,4-Trichlorobenzene	<1.0	1.0		
		Naphthalene	<1.0	1.0		
		Hexachlorobutadiene	<1.0	1.0		
		1,2,3-Trichlorobenzene	<1.0	1.0		
		Acetone	<20	20		
		Methyl Ethyl Ketone	<10	10		
		Dichlorodifluoromethane	<1.0	1.0		
		Chloromethane	<1.0	1.0		
		Vinyl Chloride	<1.0	1.0		
		Bromomethane	<1.0	1.0		
		Chloroethane	<1.0	1.0		
		Trichlorofluoromethane	<1.0	1.0		
		2-Chloroethylvinylether	<1.0	1.0		
		Carbon Disulfide	<1.0	1.0		
		Vinyl Acetate	<1.0	1.0		
		Methyl Isobutyl Ketone	<10	10		
		2-Hexanone	<10	10		
		Acrolein	<10	10		
		Acrylonitrile	<10	10		
		Methyltertiary Butyl Ether	<1.0	1.0		
		Iodomethane	<1.0	1.0		
	Surrogate Recoveries					
		1,2-Dichloroethane-d4	89	% Recovery		
		Toluene-d8	97			
		4-Bromofluorobenzene	103			

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

ENERGY LABORATORIES, INC.
RAPID CITY, SD

VOLATILE ORGANIC COMPOUNDS
QUALITY ASSURANCE REPORT FORM

SAMPLE LOT 95-38191
SAMPLE MATRIX Water
EXTRACTION DATE
ANALYST RH

MATRIX SPIKE / MATRIX SPIKE DUPLICATE DATA

Compound	Spike Added (μg)/L	Sample (μg)	Matrix Spike (μg)	Matrix Spike % Rec	Matrix Spike Duplicate (μg)	Matrix Spike Duplicate % Rec	% Difference $\left(\frac{\text{Difference}}{\text{Average}}\right)$	QC Limits
1,1-Dichloroethene	1000	<100	990	99	1030	103	4.0	60-140%
Benzene	1000	240	1290	105	1230	99	5.9	60-140%
Trichloroethene	1000	<100	1080	108	1060	106	1.9	60-140%
Toluene	1000	160	1320	116	1220	106	9.0	60-140%
Chlorobenzene	1000	<100	1130	113	1140	114	0.88	60-140%

ENERGY LABORATORIES, INC.
P.O. BOX 2470 • RAPID CITY, SD 57709 • PHONE (605) 342-1225
610 FARNWOOD STREET • RAPID CITY, SD 57701 • FAX (605) 342-1397

James Machin
Radian Corporation
3201 C. Street, Suite 405
Anchorage, AK 99503

REVISED REPORT
EAFB
Project #612-001-31-37
Sampled: 06-29/30-95

July 21, 1995
95-38229-31
Submitted: 06-29-95

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

Water Analysis

Influent-12 — 95-38229 — 8260 LONG — RH:07-13-95

Units µg/L

Analysis	Results	PQL
1,1-Dichloroethene	<1.0	1.0
Methylene Chloride	1.5	1.0
trans-1,2-Dichloroethene	<1.0	1.0
1,1-Dichloroethane	<1.0	1.0
2,2-Dichloropropane	<1.0	1.0
cis-1,2-Dichloroethene	63[2]	1.0
Bromochloromethane	<1.0	1.0
Chloroform	<1.0	1.0
1,1,1-Trichloroethane	<1.0	1.0
Carbon Tetrachloride	<1.0	1.0
1,1-Dichloropropene	<1.0	1.0
Benzene	7.5	1.0
1,2-Dichloroethane	<1.0	1.0
Trichloroethene	5.0	1.0
1,2-Dichloropropane	<1.0	1.0
Dibromomethane	<1.0	1.0
Bromodichloromethane	<1.0	1.0
Trans-1,3-Dichloropropene	<1.0	1.0
Toluene	11	1.0
cis-1,3-Dichloropropene	<1.0	1.0
1,1,2-Trichloroethane	<1.0	1.0
Tetrachloroethene	<1.0[3]	1.0
1,3-Dichloropropane	<1.0	1.0
Dibromochloromethane	<1.0	1.0
1,2-Dibromoethane	<1.0	1.0
Chlorobenzene	<1.0	1.0
1,1,1,2-Tetrachloroethane	<1.0	1.0
Ethylbenzene	11	1.0
M+P Xylenes	46[2]	1.0
O-Xylene	93	1.0
Styrene	<1.0	1.0
Bromoform	<1.0	1.0
Isopropylbenzene	2.1	1.0
Bromobenzene	<1.0	1.0
1,1,2,2-Tetrachloroethane	<1.0	1.0
1,2,3-Trichloropropane	<1.0	1.0
n-Propylbenzene	2.6	1.0
2-Chlorotoluene	<1.0	1.0
4-Chlorotoluene	<1.0	1.0
1,3,5-Trimethylbenzene	13	1.0
tert-Butylbenzene	<1.0	1.0
1,2,4-Trimethylbenzene	37[2]	1.0
sec-Butylbenzene	1.1	1.0
1,3-Dichlorobenzene	<1.0	1.0
1,4-Dichlorobenzene	<1.0	1.0
p-Isopropyltoluene	3.2	1.0
1,2-Dichlorobenzene	<1.0	1.0
n-Butylbenzene	2.2	1.0
1,2-Dibromo-3-Chloropropane	<1.0	1.0
1,2,4-Trichlorobenzene	<1.0	1.0
Naphthalene	17	1.0
Hexachlorobutadiene	<1.0	1.0

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-12		95-38229	**8260 LONG continued**				RH:07-13-95
						PQL	Units µg/L
				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone	57	20	
				Methyl Ethyl Ketone	78	10	
				Dichlorodifluoromethane	<1.0	1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether	<1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone	<10	10	
				Acrolein	<10	10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether	<1.0	1.0	
				Iodomethane	<1.0	1.0	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	78[1]	% Recovery	
				Toluene-d8	99		
				4-Bromofluorobenzene	110		

[1] Non-target compound sample matrix interference caused a supression of the 1,2-Dichloroethane-d_4.
[2] Value derived from a 10x dilution.
[3] Present but less than the Practical Quantitation Limit.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-12D			95-38230	**8260 LONG**			RH:07-13-95

Analysis	Results	PQL
		Units µg/L
1,1-Dichloroethene	<1.0	1.0
Methylene Chloride	**1.8**	1.0
trans-1,2-Dichloroethene	<1.0	1.0
1,1-Dichloroethane	<1.0	1.0
2,2-Dichloropropane	<1.0	1.0
cis-1,2-Dichloroethene	**63**[1]	1.0
Bromochloromethane	<1.0	1.0
Chloroform	<1.0	1.0
1,1,1-Trichloroethane	<1.0	1.0
Carbon Tetrachloride	<1.0	1.0
1,1-Dichloropropene	<1.0	1.0
Benzene	**8.2**	1.0
1,2-Dichloroethane	<1.0	1.0
Trichloroethene	**6.0**	1.0
1,2-Dichloropropane	<1.0	1.0
Dibromomethane	<1.0	1.0
Bromodichloromethane	<1.0	1.0
Trans-1,3-Dichloropropene	<1.0	1.0
Toluene	**12**	1.0
cis-1,3-Dichloropropene	<1.0	1.0
1,1,2-Trichloroethane	<1.0	1.0
Tetrachloroethene	**1.0**	1.0
1,3-Dichloropropane	<1.0	1.0
Dibromochloromethane	<1.0	1.0
1,2-Dibromoethane	<1.0	1.0
Chlorobenzene	<1.0	1.0
1,1,1,2-Tetrachloroethane	<1.0	1.0
Ethylbenzene	**13**	1.0
M+P Xylenes	**51**[1]	1.0
O-Xylene	**10**	1.0
Styrene	<1.0	1.0
Bromoform	<1.0	1.0
Isopropylbenzene	**2.5**	1.0
Bromobenzene	<1.0	1.0
1,1,2,2-Tetrachloroethane	<1.0	1.0
1,2,3-Trichloropropane	<1.0	1.0
n-Propylbenzene	**3.1**	1.0
2-Chlorotoluene	<1.0	1.0
4-Chlorotoluene	<1.0	1.0
1,3,5-Trimethylbenzene	**15**	1.0
tert-Butylbenzene	<1.0	1.0
1,2,4-Trimethylbenzene	**41**[1]	1.0
sec-Butylbenzene	**1.2**	1.0
1,3-Dichlorobenzene	<1.0	1.0
1,4-Dichlorobenzene	<1.0	1.0
p-Isopropyltoluene	**3.7**	1.0
1,2-Dichlorobenzene	<1.0	1.0
n-Butylbenzene	**2.5**	1.0
1,2-Dibromo-3-Chloropropane	<1.0	1.0
1,2,4-Trichlorobenzene	<1.0	1.0
Naphthalene	**19**	1.0
Hexachlorobutadiene	<1.0	1.0

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-12D		95-38230	**8260 LONG continued**				RH:07-13-95
						PQL	Units µg/L
				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone	37	20	
				Methyl Ethyl Ketone	80	10	
				Dichlorodifluoromethane	<1.0	1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether	<1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone	<10	10	
				Acrolein	<10	10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether	<1.0	1.0	
				Iodomethane	<1.0	1.0	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	81		% Recovery
				Toluene-d8	102		
				4-Bromofluorobenzene	113		

[1] Value derived from a 10x dilution.

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-13			95-38231	**8260 LONG**			RH:07-13-95

Analysis	Results	PQL
		Units μg/L
1,1-Dichloroethene	<1.0	1.0
Methylene Chloride	3.3	1.0
trans-1,2-Dichloroethene	<1.0	1.0
1,1-Dichloroethane	<1.0	1.0
2,2-Dichloropropane	<1.0	1.0
cis-1,2-Dichloroethene	30[1]	1.0
Bromochloromethane	<1.0	1.0
Chloroform	<1.0	1.0
1,1,1-Trichloroethane	<1.0	1.0
Carbon Tetrachloride	<1.0	1.0
1,1-Dichloropropene	<1.0	1.0
Benzene	1.8	1.0
1,2-Dichloroethane	<1.0	1.0
Trichloroethene	6.1	1.0
1,2-Dichloropropane	<1.0	1.0
Dibromomethane	<1.0	1.0
Bromodichloromethane	<1.0	1.0
Trans-1,3-Dichloropropene	<1.0	1.0
Toluene	4.1	1.0
cis-1,3-Dichloropropene	<1.0	1.0
1,1,2-Trichloroethane	<1.0	1.0
Tetrachloroethene	<1.0[2]	1.0
1,3-Dichloropropane	<1.0	1.0
Dibromochloromethane	<1.0	1.0
1,2-Dibromoethane	<1.0	1.0
Chlorobenzene	<1.0	1.0
1,1,1,2-Tetrachloroethane	<1.0	1.0
Ethylbenzene	4.0	1.0
M+P Xylenes	24	1.0
O-Xylene	3.3	1.0
Styrene	<1.0	1.0
Bromoform	<1.0	1.0
Isopropylbenzene	1.0	1.0
Bromobenzene	<1.0	1.0
1,1,2,2-Tetrachloroethane	<1.0	1.0
1,2,3-Trichloropropane	<1.0	1.0
n-Propylbenzene	1.3	1.0
2-Chlorotoluene	<1.0	1.0
4-Chlorotoluene	<1.0	1.0
1,3,5-Trimethylbenzene	4.6	1.0
tert-Butylbenzene	<1.0	1.0
1,2,4-Trimethylbenzene	16[1]	1.0
sec-Butylbenzene	1.2	1.0
1,3-Dichlorobenzene	<1.0	1.0
1,4-Dichlorobenzene	<1.0	1.0
p-Isopropyltoluene	1.5	1.0
1,2-Dichlorobenzene	<1.0	1.0
n-Butylbenzene	1.2	1.0
1,2-Dibromo-3-Chloropropane	<1.0	1.0
1,2,4-Trichlorobenzene	<1.0	1.0
Naphthalene	11	1.0
Hexachlorobutadiene	<1.0	1.0

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Influent-13		95-38231	**8260 LONG continued**				RH:07-13-95
						PQL	Units µg/L
				1,2,3-Trichlorobenzene	<1.0	1.0	
				Acetone	<20	20	
				Methyl Ethyl Ketone	17	10	
				Dichlorodifluoromethane	<1.0	1.0	
				Chloromethane	<1.0	1.0	
				Vinyl Chloride	<1.0	1.0	
				Bromomethane	<1.0	1.0	
				Chloroethane	<1.0	1.0	
				Trichlorofluoromethane	<1.0	1.0	
				2-Chloroethylvinylether	<1.0	1.0	
				Carbon Disulfide	<1.0	1.0	
				Vinyl Acetate	<1.0	1.0	
				Methyl Isobutyl Ketone	<10	10	
				2-Hexanone	<10	10	
				Acrolein	<10	10	
				Acrylonitrile	<10	10	
				Methyltertiary Butyl Ether	<1.0	1.0	
				Iodomethane	<1.0	1.0	
			Surrogate Recoveries				
				1,2-Dichloroethane-d4	83		% Recovery
				Toluene-d8	102		
				4-Bromofluorobenzene	102		

[1] Value derived from a 10x dilution.
[2] Present but less than the Practical Quantitation Limit.

Kurt R. Slentz
Laboratory Manager

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

QUALITY ASSURANCE DATA

Trip Blank

8260 LONG

RH:07-13-95

Units μg/L

Analysis	Result	PQL
1,1-Dichloroethene	<1.0	1.0
Methylene Chloride	<1.0	1.0
trans-1,2-Dichloroethene	<1.0	1.0
1,1-Dichloroethane	<1.0	1.0
2,2-Dichloropropane	<1.0	1.0
cis-1,2-Dichloroethene	<1.0	1.0
Bromochloromethane	<1.0	1.0
Chloroform	<1.0	1.0
1,1,1-Trichloroethane	<1.0	1.0
Carbon Tetrachloride	<1.0	1.0
1,1-Dichloropropene	<1.0	1.0
Benzene	<1.0	1.0
1,2-Dichloroethane	<1.0	1.0
Trichloroethene	<1.0	1.0
1,2-Dichloropropane	<1.0	1.0
Dibromomethane	<1.0	1.0
Bromodichloromethane	<1.0	1.0
Trans-1,3-Dichloropropene	<1.0	1.0
Toluene	<1.0	1.0
cis-1,3-Dichloropropene	<1.0	1.0
1,1,2-Trichloroetnane	<1.0	1.0
Tetrachloroethene	<1.0	1.0
1,3-Dichloropropane	<1.0	1.0
Dibromochloromethane	<1.0	1.0
1,2-Dibromoethane	<1.0	1.0
Chlorobenzene	<1.0	1.0
1,1,1,2-Tetrachloroethane	<1.0	1.0
Ethylbenzene	<1.0	1.0
M+P Xylenes	<1.0	1.0
O-Xylene	<1.0	1.0
Styrene	<1.0	1.0
Bromoform	<1.0	1.0
Isopropylbenzene	<1.0	1.0
Bromobenzene	<1.0	1.0
1,1,2,2-Tetrachloroethane	<1.0	1.0
1,2,3-Trichloropropane	<1.0	1.0
n-Propylbenzene	<1.0	1.0
2-Chlorotoluene	<1.0	1.0
4-Chlorotoluene	<1.0	1.0
1,3,5-Trimethylbenzene	<1.0	1.0
tert-Butylbenzene	<1.0	1.0
1,2,4-Trimethylbenzene	<1.0	1.0
sec-Butylbenzene	<1.0	1.0
1,3-Dichlorobenzene	<1.0	1.0
1,4-Dichlorobenzene	<1.0	1.0
p-Isopropyltoluene	<1.0	1.0
1,2-Dichlorobenzene	<1.0	1.0
n-Butylbenzene	<1.0	1.0
1,2-Dibromo-3-Chloropropane	<1.0	1.0
1,2,4-Trichlorobenzene	<1.0	1.0
Naphthalene	<1.0	1.0
Hexachlorobutadiene	<1.0	1.0

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed

Trip Blank **8260 LONG continued** RH:07-13-95

Analysis	Results	PQL	Units $\mu g/L$
1,2,3-Trichlorobenzene	<1.0	1.0	
Acetone	<20	20	
Methyl Ethyl Ketone	<1.0	10	
Dichlorodifluoromethane	<1.0	1.0	
Chloromethane	<1.0	1.0	
Vinyl Chloride	<1.0	1.0	
Bromomethane	<1.0	1.0	
Chloroethane	<1.0	1.0	
Trichlorofluoromethane	<1.0	1.0	
2-Chloroethylvinylether	<1.0	1.0	
Carbon Disulfide	<1.0	1.0	
Vinyl Acetate	<1.0	1.0	
Methyl Isobutyl Ketone	<10	10	
2-Hexanone	<10	10	
Acrolein	<10	10	
Acrylonitrile	<10	10	
Methyltertiary Butyl Ether	<1.0	1.0	
Iodomethane	<1.0	1.0	

Surrogate Recoveries

Surrogate	Result	Units
1,2-Dichloroethane-d4	82	% Recovery
Toluene-d8	109	
4-Bromofluorobenzene	113	

ENERGY LABORATORIES, INC.
RAPID CITY, SD

VOLATILE ORGANIC COMPOUNDS
QUALITY ASSURANCE REPORT FORM

SAMPLE LOT 95-38231
SAMPLE MATRIX Water
EXTRACTION DATE
ANALYST RH

MATRIX SPIKE / MATRIX SPIKE DUPLICATE DATA

Compound	Spike Added (μg)/L	Sample (μg)	Matrix Spike (μg)	Matrix Spike % Rec	Matrix Spike Duplicate (μg)	Matrix Spike Duplicate % Rec	% Difference $\left(\frac{\text{Difference}}{\text{Average}}\right)$	QC Limits
1,1-Dichloroethene	10.0	<1.0	9.4	94	9.7	97	3.1	60-140%
Benzene	10.0	1.8	11.7	99	11.8	100	1.0	60-140%
Trichloroethene	10.0	6.1	15.6	95	15.6	95	0	60-140%
Toluene	10.0	4.1	14.0	99	13.1	90	9.5	60-140%
Chlorobenzene	10.0	<1.0	11.2	112	11.1	111	0.90	60-140%

ENERGY LABORATORIES, INC.
P.O. BOX 2470 • RAPID CITY, SD 57709 • PHONE (605) 342-1225
610 FARNWOOD STREET • RAPID CITY, SD 57701 • FAX (605) 342-1397

James Machin
Radian Corporation
3201 C Street, Suite 405
Anchorage, AK 99503

November 17, 1995

Addendum to: 95-38229-31, 95-38191-95
95-38061-67, 95-38005-07

Site	Depth	Lab No.	Methodology	Analysis	Results	Units	Analyzed
Water Analysis							
			[1]	[2]	µg/L	PQL	
MW930101		95-38005	EPA 8260 Mod	TPM	45,400	200	RH:06-26-95
Effluent-1		95-38006	EPA 8260 Mod	TPM	65	20	RH:06-25-95
Influent-1		95-38007	EPA 8260 Mod	TPM	41,300	200	RH:06-26-95
Influent-2		95-38061	EPA 8260 Mod	TPM	19,300	200	RH:06-30-95
Influent-3		95-38062	EPA 8260 Mod	TPM	112,100	200	RH:07-05-95
Influent-4		95-38063	EPA 8260 Mod	TPM	42,600	200	RH:07-05-95
Influent-5		95-38064	EPA 8260 Mod	TPM	24,300	200	RH:07-05-95
Influent-6		95-38065	EPA 8260 Mod	TPM	28,100	200	RH:07-05-95
Influent-6D		95-38066	EPA 8260 Mod	TPM	31,600	200	RH:07-07-95
Influent-7		95-38067	EPA 8260 Mod	TPM	80,500	200	RH:07-06-95
Influent-8		95-38191	EPA 8260 Mod	TPM	56,700	200	RH:07-07-95
Influent-9		95-38192	EPA 8260 Mod	TPM	41,600	200	RH:07-07-95
Influent-11		95-38194	EPA 8260 Mod	TPM	65,600	200	RH:07-07-95
MW930101-Post Test		95-38195	EPA 8260 Mod	TPM	41,500	200	RH:07-05-95
Influent-12		95-38229	EPA 8260 Mod	TPM	3,180	100	RH:07-13-95
Influent-120		95-38230	EPA 8260 Mod	TPM	2,990	100	RH:07-13-95
Influent-13		95-38231	EPA 8260 Mod	TPM	1,190	100	RH:07-13-95

[1] These data were generated using a modification of EPA Method 8260. The values included in this report represent the Total Purgeable Material that eluded in the approximate range of C_5 - C_{12}. The results for TPM were derived by total integration of the chromatogram from C_5 - C_{12} and comparing the resultant area to a mean response factor for three internal and three surrogate standards. As such, these data should be considered estimated values.

[2] TPM - Total Purgeable Material.

Kurt R. Slentz
Laboratory Manager

ENERGY LABORATORIES, INC.
P.O. Box 2470 610 Farnwood Street voice 605-342-1225
Rapid City, SD 57709 fax 605-342-1397

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

P.O. #	Project Name / Address
	Ellsworth AFB 2-Phase Test

Contact Name & Phone	Sampler's signature
James Machin	J Machin

Invoice to: Radian Corp.

Report to: Radian Corp.

DATE	TIME	composite	grab sample	SAMPLE I.D.	number of containers	Sample Type: A W S V U O (Air Water Soils/solids Vegetation Urine Other)	Analysis Requested: 8260	8270							Comments, Special Instructions, etc.
6-23	1120		✓	MW930101	3		✓								
6-25-95	1620		✓	Effluent-1*	5		✓	✓							*Rapid TAT!
6-25	1630		✓	Influent-1	3		✓								Need VOC (8260) by
				Trip Blanks	2		✓								6-28-95
															SVOC by 6-29-95

	Relinquished (signature)	Date	Time	Received by: (signature)		Relinquished (signature)	Date	Time	Received by (signature):
1.	J Machin	6-25-95	1700		3.				
2.					4.		6/25/95	17:06	Received for laboratory by (signature): Kurt [signature]

ENERGY LABORATORIES, INC.
P.O. Box 2470 610 Farnwood Street voice 605-342-1225
Rapid City, SD 57709 fax 605-342-1397

CHAIN OF COUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

P.O. #

Project Name / Address: Ellsworth AFB 2-Phase Test

Contact Name & Phone: James Macklin

Sampler's signature: J Macklin

Invoice to:

Report to:

Sample Type: A W S V U O (Air Water Soils/solids Vegetation Urine Other)

Analysis Requested

DATE	TIME	composite	grab sample	SAMPLE I.D.	number of containers / Sample Type	8260								Comments, Special Instructions, etc.
6/25/95	1834		X	Influent-2	3-W	X								~~All samples~~: (Includes acetone + MIBK)
"	2120		X	Influent-3	"	"								
6/26/95	0920		X	Influent-4	"	"								
"	1215		X	Influent-5	"	"								
"	1600 ~~1622~~			Influent-6	"	"								
"	1645 ~~1628~~			Influent-6D	"	"								
6/27/95	1000			Influent-7	"	"								
				Trip Blanks										

	Relinquished (signature)	Date	Time	Received by: (signature)
1.	J Macklin	6/27/95	1148	
2.				
3.				
4.	Kent Allentz	6/27/95	11:48	Received for laboratory by (signature): Marcie Sprague

ENERGY LABORATORIES, INC.
P.O. Box 2470 610 Farnwood Street voice 605-342-1225
Rapid City, SD 57709 fax 605-342-1397

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

P.O. #:

Project Name / Address: Ellsworth AFB 2-Phase Test

Contact Name & Phone: James Maclin 907/562-0375

Sampler's signature: J. Maclin

Invoice to:

Report to:

DATE	TIME	composite	grab sample	SAMPLE I.D.	number of containers	Sample Type: A W S V U O (Air Water Soils/solids Vegetation Urine Other)	Analysis Requested: 8260								Comments, Special Instructions, etc.
6-27-95	1620		X	Influent-8	3	W	X								
6-28-95	0900		X	Influent-9	"	"	"								
"	1610		X	Influent-10 *	"	"	"								* Hold sample Influent-10. Do not analyze.
6-29-95	1135		X	Influent-11	"	"	"								
"	1350		X	MW930101-Post Test	"	"	"								
				Trip Blanks											

	Relinquished (signature)	Date	Time	Received by: (signature)		Relinquished (signature)	Date	Time	Received by (signature):
1.	J. Maclin	6-29-95	1350		3.				
2.					4.		6/29/95	1350	Received for laboratory by (signature): Marcie Sprague

ENERGY LABORATORIES, INC.
P.O. Box 2470 610 Farnwood Street voice 605-342-1225
Rapid City, SD 57709 fax 605-342-1397

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

P.O. #

Project Name / Address: ELLSWORTH AFB 2-PHASE TEST

Contact Name & Phone: JAMES MACHIN 907 562 0375

Sampler's signature: Bill Bullard

Invoice to:

Report to: JAMES MACHIN
3201 C STREET SUITE 405
ANCHORAGE AK 99503

DATE	TIME	composite	grab sample	SAMPLE I.D.	number of containers / Sample Type: A W S V U O (Air Water Soils/solids Vegetation Urine Other)	Analysis Requested: 8260								Comments, Special Instructions, etc.
6/29	1630		✓	INFLUENT -12	3-W	X								
6/29	1630		✓	INFLUENT -12D	3-W	X								
6/30	1130		✓	INFLUENT -13	3-W	X								
				Trip Blank										

	Relinquished (signature)	Date	Time	Received by: (signature)
1.				
2.				
3.				
4.	William Bullard	6/30/95	12:04	Received for laboratory by (signature): Kurt C. Slentz

APPENDIX E

Vapor Sample Analytical Data

MICROSEEPS
University of Pittsburgh Applied Research Center
220 William Pitt Way, Pittsburgh, PA 15238
(412) 826-5245
FAX (412) 826-3433

July 7, 1995

Mr. James Machin
Radian Corporation
3201 C Street
Suite 405
Anchorage, AK 99503

Dear Mr. Machin:

Attached is the final data listing for the samples we received on July 3, 1995, your project #612-001-31-37.

Please give me call if you have questions or I can be of further assistance. Thank you for using MICROSEEPS.

Sincerely,

David J. Masdea

DJM/lsp

Attachment: RAD36-952487

MICROSEEPS

ANALYSIS OF VOLATILE ORGANICS IN GAS SAMPLES

Gas samples are received and secured in accordance with Microseeps documented sample receipt procedures. Analyses are performed using Microseeps Analytical Method AM4.02. Analytical method AM4.02 is a modification of USEPA Method 3810 (Headspace) and 8000 (Gas Chromatography). Modifications implemented are to accommodate the gas phase sample type only. All applicable quality control procedures are followed including continuing calibration check standards and laboratory blanks. Microseeps Analytical Method AM4.02 will be supplied upon request.

220 William Pitt Way, Pittsburgh, PA 15238 • Phone (412) 826-5245, Fax (412) 826-3433

RAD36-952487

----- RADIAN CORP. ----

----- PROJECT NO. 612-001-31-37 -----

----- PROJECT LOC: ELLSWORTH AFB(2ND PHASE TEST) -----

----- CONCENTRATIONS IN PPMV -----

SAMPLE NAME	CHLORO METHANE	VINYL CHLORIDE	BROMO METHANE/ CHLORO ETHANE*	FLUORO TRICHLORO METHANE	1,1 DICHLORO ETHYLENE	METHYLENE CHLORIDE	TRANS-1,2 DICHLORO ETHYLENE	1,1 DICHLORO ETHANE	CHLOROFORM	1,1,1 TRICHLORO ETHANE	CARBON TETRA CHLORIDE	BENZENE	1,2 DICHLORO ETHANE	TRICHLORO ETHYLENE	1,2 DICHLORO PROPANE
V-1	1	<1	<1	<.005	0.54	<1	0.5	0.69	0.006	<.005	<.005	37.99	0.05	0.633	<.01
V-2	<1	<1	<1	<.005	0.57	<1	0.5	0.74	0.006	<.005	<.005	62.56	0.11	1.813	<.01
V-3	<1	<1	<1	<.005	0.59	<1	0.5	0.77	0.005	<.005	<.005	67.39	0.12	2.419	<.01
V-4	1	<1	<1	<.005	0.56	<1	0.5	0.77	<.005	<.005	<.005	66.64	0.12	2.569	<.01
V-5	<1	<1	<1	<.005	0.58	<1	0.6	0.77	<.005	<.005	<.005	72.64	0.12	2.953	<.01
V-6	<1	<1	<1	<.005	0.47	<1	0.6	0.80	<.005	0.006	<.005	67.63	0.11	3.477	<.01
V-7	<1	<1	<1	<.005	0.43	<1	0.6	0.79	<.005	0.006	<.005	61.42	0.12	3.370	<.01
V-8	<1	<1	<1	<.005	0.40	<1	0.6	0.79	<.005	0.006	<.005	58.98	0.12	3.475	<.01
V-8D	<1	<1	<1	<.005	0.36	<1	0.6	0.78	<.005	0.006	<.005	53.78	0.12	3.195	<.01
V-9	<1	<1	<1	<.005	0.31	<1	0.6	0.78	<.005	0.007	<.005	50.46	0.12	3.694	<.01
V-10	<1	<1	<1	<.005	0.23	<1	0.5	0.71	<.005	0.006	<.005	40.84	0.06	3.058	<.01
V-11	<1	<1	<1	<.005	0.27	<1	0.5	0.75	<.005	0.007	<.005	49.85	0.12	4.064	<.01
V-13	<1	<1	<1	<.005	0.18	<1	0.5	0.72	<.005	0.007	<.005	37.71	0.07	3.558	<.01
V-14	<1	<1	<1	<.005	0.22	<1	0.5	0.75	<.005	0.008	<.005	39.93	0.06	3.590	<.01
V-15	<1	<1	<1	<.005	<.01	<1	0.2	0.29	<.005	<.005	<.005	0.26	0.02	0.012	0.06
V-15D	<1	<1	<1	<.005	<.01	<1	0.2	0.28	<.005	<.005	<.005	0.25	0.01	0.010	0.06
V-16	<1	<1	<1	<.005	<.01	<1	0.1	0.36	<.005	<.005	<.005	0.25	0.02	0.006	0.05
MDLs	1	1	1	0.005	0.01	1	0.01	0.01	0.005	0.005	0.005	0.07	0.01	0.005	0.01

* COMPOUNDS ELUTE TOGETHER ON ECD: VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

MICROSEEPS 07-Jul-95

ANALYST INITIALS JW

LAB MANAGER INITIALS DJM

----- RADIAN CORP. ----

----- PROJECT NO. 612-001-31-37 -----

----- PROJECT LOC: ELLSWORTH AFB(2ND PHASE TEST) -----

----- CONCENTRATIONS IN PPMV -----

SAMPLE NAME	BROMO DICHLORO METHANE	CIS-1,3 DICHLORO PROPYLENE	TOLUENE	TRANS-1,3 DICHLORO PROPYLENE	1,1,2 TRICHLORO ETHANE	TETRA CHLORO ETHYLENE	CHLORO DIBROMO METHANE	CHLORO BENZENE	ETHYL BENZENE	BROMO FORM	1,1,2,2 TETRA CHLORO ETHANE	1,3 DICHLORO BENZENE	1,4 DICHLORO BENZENE	1,2 DICHLORO BENZENE
V-1	<.005	<.01	<.07	<.01	<.005	0.038	<.005	<.07	1.26	<.005	<.005	<.07	<.07	<.07
V-2	<.005	<.01	<.07	<.01	<.005	0.145	<.005	<.07	5.34	<.005	<.005	<.07	<.07	<.07
V-3	<.005	<.01	<.07	<.01	<.005	0.216	<.005	<.07	7.02	<.005	<.005	<.07	<.07	<.07
V-4	<.005	<.01	<.07	<.01	<.005	0.233	<.005	<.07	7.24	<.005	<.005	<.07	<.07	<.07
V-5	<.005	<.01	<.07	<.01	<.005	0.256	<.005	<.07	7.28	<.005	<.005	<.07	<.07	<.07
V-6	<.005	<.01	<.07	<.01	<.005	0.343	<.005	<.07	8.54	<.005	<.005	<.07	<.07	<.07
V-7	<.005	<.01	<.07	<.01	<.005	0.339	<.005	<.07	8.34	<.005	<.005	<.07	<.07	<.07
V-8	<.005	<.01	<.07	<.01	<.005	0.351	<.005	<.07	8.05	<.005	<.005	<.07	<.07	<.07
V-8D	<.005	<.01	<.07	<.01	<.005	0.328	<.005	<.07	7.55	<.005	<.005	<.07	<.07	<.07
V-9	<.005	<.01	<.07	<.01	<.005	0.417	<.005	<.07	8.26	<.005	<.005	<.07	<.07	<.07
V-10	<.005	<.01	<.07	<.01	<.005	0.371	<.005	<.07	7.25	<.005	<.005	<.07	<.07	<.07
V-11	<.005	<.01	<.07	<.01	<.005	0.522	<.005	<.07	8.66	<.005	<.005	<.07	<.07	<.07
V-13	<.005	<.01	<.07	<.01	<.005	0.520	<.005	<.07	7.27	<.005	<.005	<.07	<.07	<.07
V-14	<.005	<.01	<.07	<.01	<.005	0.359	<.005	<.07	4.34	<.005	<.005	<.07	<.07	<.07
V-15	<.005	<.01	<.07	<.01	<.005	0.010	<.005	<.07	0.21	<.005	<.005	<.07	<.07	<.07
V-15D	<.005	<.01	<.07	<.01	<.005	0.009	<.005	<.07	0.19	<.005	<.005	<.07	<.07	<.07
V-16	<.005	<.01	<.07	<.01	<.005	<.005	<.005	<.07	<.07	<.005	<.005	<.07	<.07	<.07
MDLs	0.005	0.01	0.07	0.01	0.005	0.005	0.005	0.07	0.07	0.005	0.005	0.07	0.07	0.07

ANALYST INITIALS JCH

LAB MANAGER INITIALS DJM

----- RADIAN CORP. ----

----- PROJECT NO. 612-001-31-37 -----

----- PROJECT LOC: ELLSWORTH AFB(2ND PHASE TEST) -----

----- CONCENTRATIONS IN PPMV -----

ADDITIONAL ANALYSIS

SAMPLE NAME	ACETONE	MIBK	M&P XYLENE	O- XYLENE	TOTAL C5-C10	FILE NAME	DATE SAMPLED	TIME SAMPLED	DATE RECEIVED	DATE ANALYZED
V-1	<2	<1	1.13	0.38	3628.59	W53 279	06/25/95	1156	07/03/95	07/04/95
V-2	<2	<1	9.83	3.48	6350.99	W53 280	06/25/95	1322	07/03/95	07/04/95
V-3	<2	<1	19.43	6.16	6932.84	W53 281	06/25/95	1602	07/03/95	07/04/95
V-4	<2	<1	21.84	6.77	6784.85	W53 282	06/25/95	1828	07/03/95	07/04/95
V-5	<2	<1	22.49	6.70	7193.84	W53 283	06/25/95	2054	07/03/95	07/04/95
V-6	<2	<1	28.29	8.72	6750.07	W53 284	06/26/95	900	07/03/95	07/04/95
V-7	<2	<1	28.01	8.90	6254.79	W53 285	06/26/95	1215	07/03/95	07/04/95
V-8	<2	<1	27.54	8.73	6079.08	W53 286	06/26/95	1638	07/03/95	07/04/95
V-8D	<2	<1	25.80	8.38	5585.52	W53 287	06/26/95	1639	07/03/95	07/04/95
V-9	<2	<1	29.22	9.42	5386.28	W53 288	06/27/95	948	07/03/95	07/04/95
V-10	<2	<1	26.54	8.82	4430.23	W53 292	06/27/95	1614	07/03/95	07/04/95
V-11	<2	<1	31.86	10.18	5354.66	W53 293	06/28/95	902	07/03/95	07/04/95
V-13	<2	<1	29.52	9.98	4267.64	W53 294	06/29/95	1130	07/03/95	07/04/95
V-14	<2	<1	16.49	4.68	3935.96	W53 295	06/29/95	1338	07/03/95	07/05/95
V-15	<2	<1	1.40	0.82	52.01	W53 296	06/29/95	1645	07/03/95	07/05/95
V-15D	<2	<1	1.29	0.82	48.78	W53 297	06/29/95	1645	07/03/95	07/05/95
V-16	<2	<1	0.08	<.07	8.91	W53 298	06/30/95	1115	07/03/95	07/05/95
MDLs	2	1	.07	.07	.07					

MICROSEEPS 07-Jul-95

ANALYST INITIALS JAV

LAB MANAGER INITIALS DTM

RAD36-952487

----- RADIAN CORP. ----
----- PROJECT NO. 612-001-31-37 -----
----- PROJECT LOC: ELLSWORTH AFB(2ND PHASE TEST) ---
----- CONCENTRATIONS IN PPMV -----

CONTINUING CALIBRATION CHECK

STANDARDS: "624"(LEVEL 2), "624"(LEVEL 1), "VC-996", "8240D", "L" R4
REFERENCE: W53A/B268, W53A/B269, W53A272, W53A277, W53A252

COMPOUND	KNOWN	RESULT	PERCENT DIFFERENCE
CHLOROMETHANE	20.8	22.6	8.03
VINYL CHLORIDE	996.0	975.5	2.10
BROMOMETHANE/CHLOROETHANE*	2.7	2.6	3.36
FLUOROTRICHLOROMETHANE	0.765	0.744	2.82
1,1 DICHLOROETHYLENE	1.09	1.07	1.12
METHYLENE CHLORIDE	1.24	1.20	3.25
TRANS-1,2 DICHLOROETHYLENE	1.09	1.07	1.40
1,1 DICHLOROETHANE	1.06	1.05	0.85
CHLOROFORM	0.881	0.865	1.85
1,1,1 TRICHLOROETHANE	0.788	0.775	1.68
CARBON TETRACHLORIDE	0.684	0.671	1.94
BENZENE & 1,2-DCA**	2.41	2.38	1.35
1,2 DICHLOROETHANE	1.06	1.04	1.82
TRICHLOROETHYLENE	0.800	0.784	2.04
1,2 DICHLOROPROPANE	0.93	0.91	2.20
BROMODICHLOROMETHANE	0.642	0.627	2.39
CIS-1,3 DICHLOROPROPYLENE	0.95	0.92	3.16
TOLUENE	1.14	1.04	9.40
TRANS-1,3 DICHLOROPROPYLENE	0.95	0.91	3.83
1,1,2 TRICHLOROETHANE	0.788	0.780	1.03
TETRACHLOROETHYLENE	0.634	0.629	0.79
CHLORODIBROMOMETHANE	0.505	0.496	1.81
CHLOROBENZENE	0.93	0.88	6.74
ETHYL BENZENE	0.99	0.95	4.54
BROMOFORM	0.416	0.406	2.46
1,1,2,2 TETRACHLOROETHANE	0.626	0.620	0.97
1,3 DICHLOROBENZENE	0.72	0.68	5.30
1,4 DICHLOROBENZENE	0.72	0.72	0.56
1,2 DICHLOROBENZENE	0.72	0.71	0.85
ACETONE	33.5	29.0	15.56
MIBK	21.0	19.0	10.31
M&P XYLENE	1.71	1.90	10.00
O-XYLENE	0.86	0.87	0.58

* COMPOUNDS ELUTE TOGETHER ON ECD - VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.
** COMPOUNDS ELUTE TOGETHER ON FID - VALUE REPRESENTS A COMBINATION OF BOTH.

MICROSEEPS 06-Jul-95 ANALYST INITIALS JWW LAB MANAGER INITIALS DJM

RAD36-952487

----- RADIAN CORP. ----
----- PROJECT NO. 612-001-31-37 -----
----- PROJECT LOC: ELLSWORTH AFB(2ND PHASE TEST) -----
----- CONCENTRATIONS IN PPMV -----

LABORATORY BLANK RESULTS

N2 IN VIAL
REFERENCE: W53A/B276

COMPOUND	BLANK	LOWER DETECTION LIMIT
CHLOROMETHANE	ND	1.0
VINYL CHLORIDE	ND	1.0
BROMOMETHANE/CHLOROETHANE*	ND	1.0
FLUOROTRICHLOROMETHANE	ND	0.005
1,1 DICHLOROETHYLENE	ND	0.01
METHYLENE CHLORIDE	ND	1.00
TRANS-1,2 DICHLOROETHYLENE	ND	0.1
1,1 DICHLOROETHANE	ND	0.01
CHLOROFORM	ND	0.005
1,1,1 TRICHLOROETHANE	ND	0.005
CARBON TETRACHLORIDE	ND	0.005
BENZENE	ND	0.07
1,2 DICHLOROETHANE	ND	0.01
TRICHLOROETHYLENE	ND	0.005
1,2 DICHLOROPROPANE	ND	0.01
BROMODICHLOROMETHANE	ND	0.005
CIS-1,3 DICHLOROPROPYLENE	ND	0.01
TOLUENE	ND	0.07
TRANS-1,3 DICHLOROPROPYLENE	ND	0.01
1,1,2 TRICHLOROETHANE	ND	0.005
TETRACHLOROETHYLENE	ND	0.005
CHLORODIBROMOMETHANE	ND	0.005
CHLOROBENZENE	ND	0.07
ETHYL BENZENE	ND	0.07
BROMOFORM	ND	0.005
1,1,2,2 TETRACHLOROETHANE	ND	0.005
1,3 DICHLOROBENZENE	ND	0.07
1,4 DICHLOROBENZENE	ND	0.07
1,2 DICHLOROBENZENE	ND	0.07
ACETONE	ND	2.0
MIBK	ND	1.0
M&P XYLENE	ND	0.07
O-XYLENE	ND	0.07

* COMPOUNDS ELUTE TOGETHER ON ECD - VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

MICROSEEPS 06-Jul-95 ANALYST INITIALS JCL LAB MANAGER INITIALS DJM

MICROSEEPS

University of Pittsburgh Applied Research Center
220 William Pitt Way, Pittsburgh, PA 15238
(412) 826-5245
FAX (412) 826-3433

November 20, 1995

Mr. James Machin
Radian Corporation
3201 C Street
Suite 405
Anchorage, AK 99503

Dear Mr. Machin:

Attached is the additional data listing for the samples we received on July 3, 1995, your project #612-001-31-37.

Please give me call if you have questions or I can be of further assistance. Thank you for using MICROSEEPS.

Sincerely,

David J. Masdea

DJM/lsp

Attachment: RAD36-952487

----- RADIAN CORP. ----

----- PROJECT NO. 612-001-31-37 -----

----- PROJECT LOC: ELLSWORTH AFB(2ND PHASE TEST) -----

----- CONCENTRATIONS IN PPMV -----

SAMPLE NAME	CHLORO METHANE	VINYL CHLORIDE	BROMO METHANE/ CHLORO ETHANE*	FLUORO TRICHLORO METHANE	1,1 DICHLORO ETHYLENE	METHYLENE CHLORIDE	TRANS-1,2 DICHLORO ETHYLENE	1,1 DICHLORO ETHANE	CHLOROFORM	1,1,1 TRICHLORO ETHANE	CARBON TETRA CHLORIDE	BENZENE	1,2 DICHLORO ETHANE	TRICHLORO ETHYLENE	1,2 DICHLORO PROPANE
V-1	1	<1	<1	<.005	0.54	<1	0.5	0.69	0.006	<.005	<.005	37.99	0.05	0.633	<.01
V-2	<1	<1	<1	<.005	0.57	<1	0.5	0.74	0.006	<.005	<.005	62.56	0.11	1.813	<.01
V-3	<1	<1	<1	<.005	0.59	<1	0.5	0.77	0.005	<.005	<.005	67.39	0.12	2.419	<.01
V-4	1	<1	<1	<.005	0.56	<1	0.5	0.77	<.005	<.005	<.005	66.64	0.12	2.569	<.01
V-5	<1	<1	<1	<.005	0.58	<1	0.6	0.77	<.005	<.005	<.005	72.64	0.12	2.953	<.01
V-6	<1	<1	<1	<.005	0.47	<1	0.6	0.80	<.005	0.006	<.005	67.63	0.11	3.477	<.01
V-7	<1	<1	<1	<.005	0.43	<1	0.6	0.79	<.005	0.006	<.005	61.42	0.12	3.370	<.01
V-8	<1	<1	<1	<.005	0.40	<1	0.6	0.79	<.005	0.006	<.005	58.98	0.12	3.475	<.01
V-8D	<1	<1	<1	<.005	0.36	<1	0.6	0.78	<.005	0.006	<.005	53.78	0.12	3.195	<.01
V-9	<1	<1	<1	<.005	0.31	<1	0.6	0.78	<.005	0.007	<.005	50.46	0.12	3.694	<.01
V-10	<1	<1	<1	<.005	0.23	<1	0.5	0.71	<.005	0.006	<.005	40.84	0.06	3.058	<.01
V-11	<1	<1	<1	<.005	0.27	<1	0.5	0.75	<.005	0.007	<.005	49.85	0.12	4.064	<.01
V-13	<1	<1	<1	<.005	0.18	<1	0.5	0.72	<.005	0.007	<.005	37.71	0.07	3.558	<.01
V-14	<1	<1	<1	<.005	0.22	<1	0.5	0.75	<.005	0.008	<.005	39.93	0.06	3.590	<.01
V-15	<1	<1	<1	<.005	<.01	<1	0.2	0.29	<.005	<.005	<.005	0.26	0.02	0.012	0.06
V-15D	<1	<1	<1	<.005	<.01	<1	0.2	0.28	<.005	<.005	<.005	0.25	0.01	0.010	0.06
V-16	<1	<1	<1	<.005	<.01	<1	0.1	0.36	<.005	<.005	<.005	0.25	0.02	0.006	0.05
MDLs	1	1	1	0.005	0.01	1	0.1	0.01	0.005	0.005	0.005	0.07	0.01	0.005	0.01

* COMPOUNDS ELUTE TOGETHER ON ECD: VALUES REPRESENT EITHER OR A COMBINATION OF BOTH.

MICROSEEPS 16-Nov-95

ANALYST INITIALS

LAB MANAGER INITIALS DTM

RAD36-952487

----- RADIAN CORP. ----

----- PROJECT NO. 612-001-31-37 -----

----- PROJECT LOC: ELLSWORTH AFB(2ND PHASE TEST) -----

----- CONCENTRATIONS IN PPMV -----

SAMPLE NAME	BROMO DICHLORO METHANE	CIS-1,3 DICHLORO PROPYLENE	TOLUENE	TRANS-1,3 DICHLORO PROPYLENE	1,1,2 TRICHLORO ETHANE	TETRA CHLORO ETHYLENE	CHLORO DIBROMO METHANE	CHLORO BENZENE	ETHYL BENZENE	BROMO FORM	1,1,2,2 TETRA CHLORO ETHANE	1,3 DICHLORO BENZENE	1,4 DICHLORO BENZENE	1,2 DICHLORO BENZENE
V-1	<.005	<.01	<.07	<.01	<.005	0.038	<.005	<.07	1.26	<.005	<.005	<.07	<.07	<.07
V-1	<.005	<.01	<.07	<.01	<.005	0.038	<.005	<.07	1.26	<.005	<.005	<.07	<.07	<.07
V-2	<.005	<.01	<.07	<.01	<.005	0.145	<.005	<.07	5.34	<.005	<.005	<.07	<.07	<.07
V-3	<.005	<.01	<.07	<.01	<.005	0.216	<.005	<.07	7.02	<.005	<.005	<.07	<.07	<.07
V-4	<.005	<.01	<.07	<.01	<.005	0.233	<.005	<.07	7.24	<.005	<.005	<.07	<.07	<.07
V-5	<.005	<.01	<.07	<.01	<.005	0.256	<.005	<.07	7.28	<.005	<.005	<.07	<.07	<.07
V-6	<.005	<.01	<.07	<.01	<.005	0.343	<.005	<.07	8.54	<.005	<.005	<.07	<.07	<.07
V-7	<.005	<.01	<.07	<.01	<.005	0.339	<.005	<.07	8.34	<.005	<.005	<.07	<.07	<.07
V-8	<.005	<.01	<.07	<.01	<.005	0.351	<.005	<.07	8.05	<.005	<.005	<.07	<.07	<.07
V-8D	<.005	<.01	<.07	<.01	<.005	0.328	<.005	<.07	7.55	<.005	<.005	<.07	<.07	<.07
V-9	<.005	<.01	<.07	<.01	<.005	0.417	<.005	<.07	8.26	<.005	<.005	<.07	<.07	<.07
V-10	<.005	<.01	<.07	<.01	<.005	0.371	<.005	<.07	7.25	<.005	<.005	<.07	<.07	<.07
V-11	<.005	<.01	<.07	<.01	<.005	0.522	<.005	<.07	8.66	<.005	<.005	<.07	<.07	<.07
V-13	<.005	<.01	<.07	<.01	<.005	0.520	<.005	<.07	7.27	<.005	<.005	<.07	<.07	<.07
V-14	<.005	<.01	<.07	<.01	<.005	0.359	<.005	<.07	4.34	<.005	<.005	<.07	<.07	<.07
V-15	<.005	<.01	<.07	<.01	<.005	0.010	<.005	<.07	0.21	<.005	<.005	<.07	<.07	<.07
V-15D	<.005	<.01	<.07	<.01	<.005	0.009	<.005	<.07	0.19	<.005	<.005	<.07	<.07	<.07
V-16	<.005	<.01	<.07	<.01	<.005	<.005	<.005	<.07	<.07	<.005	<.005	<.07	<.07	<.07
MDLs	0.005	0.01	0.07	0.01	0.005	0.005	0.005	0.07	0.07	0.005	0.005	0.07	0.07	0.07

MICROSEEPS 16-Nov-95

ANALYST INITIALS JAl

LAB MANAGER INITIALS DOM

----- PROJECT NO. 612-001-31-37 -----

----- PROJECT LOC: ELLSWORTH AFB(2ND PHASE TEST) -----

----- CONCENTRATIONS IN PPMV -----

ADDITIONAL ANALYSIS

SAMPLE NAME	ACETONE	MIBK	M&P XYLENE	O-XYLENE	CIS-1,2 DICHLORO ETHYLENE	TOTAL C5-C10	FILE NAME	DATE SAMPLED	TIME SAMPLED	DATE RECEIVED	DATE ANALYZED
V-1	<2	<1	1.13	0.38	61.9	3628.59	W53 279	06/25/95	1156	07/03/95	07/04/95
V-2	<2	<1	9.83	3.48	71.0	6350.99	W53 280	06/25/95	1322	07/03/95	07/04/95
V-3	<2	<1	19.43	6.16	74.0	6932.84	W53 281	06/25/95	1602	07/03/95	07/04/95
V-4	<2	<1	21.84	6.77	74.9	6784.85	W53 282	06/25/95	1828	07/03/95	07/04/95
V-5	<2	<1	22.49	6.70	81.0	7193.84	W53 283	06/25/95	2054	07/03/95	07/04/95
V-6	<2	<1	28.29	8.72	75.9	6750.07	W53 284	06/26/95	900	07/03/95	07/04/95
V-7	<2	<1	28.01	8.90	70.2	6254.79	W53 285	06/26/95	1215	07/03/95	07/04/95
V-8	<2	<1	27.54	8.73	68.2	6079.08	W53 286	06/26/95	1638	07/03/95	07/04/95
V-8D	<2	<1	25.80	8.38	63.2	5585.52	W53 287	06/26/95	1639	07/03/95	07/04/95
V-9	<2	<1	29.22	9.42	60.1	5386.28	W53 288	06/27/95	948	07/03/95	07/04/95
V-10	<2	<1	26.54	8.82	47.7	4430.23	W53 292	06/27/95	1614	07/03/95	07/04/95
V-11	<2	<1	31.86	10.18	57.0	5354.66	W53 293	06/28/95	902	07/03/95	07/04/95
V-13	<2	<1	29.52	9.98	44.5	4267.64	W53 294	06/29/95	1130	07/03/95	07/04/95
V-14	<2	<1	16.49	4.68	49.3	3935.96	W53 295	06/29/95	1338	07/03/95	07/05/95
V-15	<2	<1	1.40	0.82	0.2	52.01	W53 296	06/29/95	1645	07/03/95	07/05/95
V-15D	<2	<1	1.29	0.82	0.2	48.78	W53 297	06/29/95	1645	07/03/95	07/05/95
V-16	<2	<1	0.08	<.07	<.1	8.91	W53 298	06/30/95	1115	07/03/95	07/05/95
MDLs	2	1	.07	.07	0.1	.07					

ANALYST INITIALS

LAB MANAGER INITIALS DOM

MICROSEEPS, Inc.

220 William Pitt Way, Pittsburgh, PA 15238

Phone: (412) 826-5245 Fax: (412) 826-3433

CHAIN-OF-CUSTODY RECORD

Page 1/2

Note: Enter proper letters in Requested Analyses columns below.

Note: If analysis D,E,or K is selected, scratch (option) NOT wanted.

Company Name: Radian Corp.

Address: 3201 C St., Suite 405, Anchorage, AK 99503

Proj. Manager: James Machin

Proj. Location: Ellsworth AFB 2-Phase Test

Proj. Number: 612-001-31-37

Phone #: 907/562-0375 Fax #: 907/562-9688

Sampler's signature: J Machin

Analysis Options

* A	C1 -C4	G	Chlorinated HC
* B	Hydrogen & Helium	H	BTEX
* C	Permanent Gases (CH4, CO, CO2, N2, O2)	J	BTEX & C5 - C10
D	Mercury (Soil) or (Air **)	K	TPH (C5 - C10) or (C4 -C12)
E	TO-14 by GC/MS (Ambient) or (Source **)	L	C11 - C18
F	601 & 602 Compounds	Other	Specify below.

* An additional 22 ml vial of sample is required when requested in combination with another analysis.

** Available upon request.

Collection Date	Collection Time	Number of Containers	"Summa" # if Can. used	Sample Type	Sample Identification	Requested Analyses					(Other)	Remarks
6-25-95	1156	1		Soil gas	V-1	F					acetone, MIBK, xylenes	Same analyses
"	1322	1		2-phase	V-2	"					"	for all samples
"	1602	1		"	V-3	"					"	
"	1828	1		"	V-4	"					"	
"	2054	1		"	V-5	"					"	
6-26-95	0900	1		"	V-6	"					"	
"	1215	1		"	V-7	"					"	
"	~~1642~~ 1638	1		"	V-8	"					"	
"	1639	1		"	V-8D	"					"	
6-27-95	0948	1		"	V-9	"					"	
	1614	1		"	V-10	"					"	

Results to: James Machin

Invoice to:

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
J Machin	Radian	6/28/95	1700	Jack Williams	MICROSEEPS	7/03/95	

WHITE COPY : Laboratory to return. YELLOW COPY : Laboratory PINK COPY : Submitter

Dave Masdea or Clark Sharlock

MICROSEEPS, Inc.

220 William Pitt Way, Pittsburgh, PA 15238

Phone: (412) 826-5245 Fax: (412) 826-3433

CHAIN-OF-CUSTODY RECORD

Page 2/2

Company Name: Radian Corp.
Address: 3201 C St. Suite 405, Anchorage, AK 99503
Proj. Manager: James Machin
Proj. Location: Ellsworth AFB 2-Phase Test
Proj. Number: 612-001-31-37
Phone #: 907/562-0375 Fax #: 907/562-9688
Sampler's signature : [signature]

Note: Enter proper letters in Requested Analyses columns below.
Note: If analysis D,E,or K is selected, scratch (option) NOT wanted.

Analysis Options

* A	C1 -C4	G	Chlorinated HC
* B	Hydrogen & Helium	H	BTEX
* C	Permanent Gases (CH4, CO, CO2, N2, O2)	J	BTEX & C5 - C10
D	Mercury (Soil) or (Air **)	K	TPH (C5 - C10) or (C4 -C12)
E	TO-14 by GC/MS (Ambient) or (Source **)	L	C11 - C18
F	601 & 602 Compounds	Other	Specify below.

* An additional 22 ml vial of sample is required when requested in combination with another analysis.

** Available upon request.

Collection Date	Collection Time	Number of Containers	"Summa" # if Can. used	Sample Type	Sample Identification	Requested Analyses					(Other)	Remarks
6-28-95	0902	1		2-phase	V-11	F					acetone, MIBK,	xylenes - all samples
6-28-95	1615	1		"	V-12 *	"					"	Hold sample V-12. Do not analyze. *
6-29-95	1130	1		"	V-13	"					"	
"	1338	1		soil gas	V-14	"					"	
6-29-95	1645	1		2-PHASE	V-15	"					"	
6-29-95	"	1		"	V-15 D	"					"	
6-30-95	1115	1		2-PHASE	V-16	"					"	

Results to : JAMES MACHIN

Invoice to :

Relinquished by	Company	Date	Time	Received by	Company	Date	Time
[signature]	Radian	6/30/95	1700	[signature]	MICROSEEPS	7/03/95	

WHITE COPY : Laboratory to return. YELLOW COPY : Laboratory PINK COPY : Submitter